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INDEX

TO THE

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(A) is an abbreviation for Abstract or Notes.

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EDITORIALS

A PERSONAL WORD

With this, the first number of the fifth volume of the American Journal of Public Hygiene, a few words in regard to its past and a few announcements for the future may not be out of place.

Five years ago, foreseeing the need for a national publication devoted exclusively to the public hygienist and sanitarian, this Journal was launched. As previous to that date the Journal had been but the mouthpiece of a State public health organization, it was some little time before the country at large could look upon it except in that light. As with most other ventures of the kind the fight has been an uphill one against heavy odds, and the time and energy of the Editors have been put into the work without thought of reward except that which may have come from the result obtained. Credit is largely due to the present Associate Editor for his foresight in perceiving the field which the Journal might some time fill, and to the Massachusetts Association of Boards of Health for its loyal backing.

Last year the JOURNAL served as the official organ of the Laboratory Section of the American Public Health Association. This year it retains that honor and becomes besides the organ of the Association itself, as well as of the two new Sections of Municipal Health Officers and of Vital Statistics.

During the past year there have been times when the cost of publication of an issue were greater than the proportional part of the subscription price. During the present year the number of pages per issue will probably average two hunderd, or one hundred pages more per issue than last year. It is, therefore, no longer possible to accept subscriptions at the old rate and pay expenses. The new rate will be $1.50 per year or 40 cents per number in the United States and Mexico, and $1.75 per year or 45 cents per number for Canadian and foreign subscriptions. For the present, as an acknowledgment of their loyalty, old subscribers will be allowed to renew at the old rate.

An innovation with this number will be found on the first rear advertising page, where for subscribers and members of the two Associations which we represent, announcements will be made free of charge of professional openings and positions wanted in hygiene work.

With the idea of making the JOURNAL as serviceable and readable as possible the Editors welcome suggestions and criticism. We ask our readers to bear in mind, however, that our activities are chiefly governed by our limited resources, and that a suggestion requiring the outlay of dollars and cents to be practical should be accompanied by one leading to a larger subscription list. A list of names of people interested in some way in sanitation or hygiene may indirectly lead to a larger and more influential organ.

B. R. RICKARDS.

SOME ASPECTS OF THE ALCOHOL QUESTION

THE so-called temperance question is, as a rule, most intemperately discussed. The advocates of total abstinence seem to feel that their position requires that they deny all utility to alcohol as an adjunct to the diet. Those who indorse its regular use are often equally extreme in their claims. Deliberately or unconsciously they underestimate drawbacks and dangers, while they make much of dubious advantages. Insincerity of argument is not confined to either side.

The highest moral consideration which leads to total abstinence is that of regard for the example which one sets to others. With this ethical matter the writer has no occasion to deal. It is his object merely to weigh, with the least possible prejudice, what may be said of alcohol on physiological and dietetic grounds.

We live in a country in which the agitation against alcohol has been strong and ably led. We find it used mainly by the wealthy and the poor, while quite generally excluded by those in moderate circumstances. In such an environment we are likely to forget how generally this fermentation product is consumed the world over. It is something of a shock to us to find how nearly universal has been its praise in the older literature and how few of the great men of history have avoided its use. The Bible includes passages which celebrate, as well as others which reprobate, the drinking of wine. Yet from most ancient times the disastrous effects of intemperance have been recorded, and now and again there have been efforts to stamp out the use of alcohol. The greatest of these movements has been that instituted by Mohammed. The sentiment which has become so strong

in our own time and land dates back barely one hundred years to the days of Benjamin Rush and Lyman Beecher.

The tendency to take a partial and partisan view of the alcohol question arises from the fact that this chemical compound has many effects on the human system, and a writer usually fixes his attention on one class only. With most articles of diet the comparison of merits and disadvantages is easy, with alcohol this is difficult. We propose to separate under five heads some of its characteristics, discussing it successively as a relish, a food, a drug, a mental alterative and a poison.

The value of a relish may be much more than æsthetic. Palatability of food is not important merely as a matter of present pleasure, but is often the guarantee of successful digestion. Physiologists recognize the existence of a class of bodies which they call food accessories, forming a very small fraction of the diet as measured by weight, but giving it distinctive character through the flavors and odors which they confer. Hunger, or at least lively appetite, is no doubt "the best sauce," but in default of appetite material substitutes are extremely useful. Alcohol cannot be denied a place among such promoters of digestion. It is known to quicken the flow of gastric juice, while it does not hinder the action of this secretion unless it is taken in great concentration. The finer beverages reinforce the direct effect of the alcohol through their choice and delicate fragrance, appealing so pleasantly to the consciousness of the leisurely diner. On the other hand, it may be said that it is sound hygiene to teach the maintenance of such a degree of health that the appetite shall not require whetting and, moreover, that well-cooked and varied food ought to be sufficiently attractive without the preliminary cocktail or accompanying wine. It is clear, too, that the admission of alcohol as a relish does not justify its use apart from meals.

There has been much loose debate concerning the food value of alcohol. Total abstainers, not content to rest their

case on the obvious ruin wrought by drink, have been vehement in denying it all possible service in nutrition. They have had a certain amount of scientific support. But there seems to be ample reason to regard alcohol as a food, providing we adopt a reasonable definition of the latter term. It cannot make any part of the body, so far as we know. Neither living tissue, nor lifeless fat, nor the starch-like reserve store called glycogen can be produced from it. It is not a building material, and it cannot be retained as a fuel against a future time of need. But then, only a small part of any diet enters into relations with the body for more than a few hours. Most of our food serves us by the release of its chemical energy in undergoing a prompt destruction. As alcohol in small quantities is destroyed like the rest and as its energy is likewise set free, it becomes a source of heat as truly as though it were burned in a lamp. We must grant it a place among possible foods, though in so doing we do not recommend its use any more than we advocate the consumption of any other article which is injurious and expensive. A man may reduce his potato or his rice by the substitution of alcohol, but the possibility does not make the change advisable.

Dr. S. J. Meltzer has said that "alcohol in health is mostly a curse and in disease mostly a blessing." Its marked value in sickness lies in the fact that it is at once a food and an accessory, that it requires no digestion and that it is swiftly absorbed. It can reach the circulation and serve the body at times when the digestive glands refuse to secrete. This is not equally true of any other food, unless it be grape-sugar, which, of course, cannot be taken freely by the sick. Whiskey has probably saved many lives in cases where its employment as a food has tided patients over critical periods, sparing their limited resources in fat and tissue on which, except for the substitution, the tax of heat production must have been levied. But the lives saved by alcohol in sickness must be few indeed compared with the number sacrificed through

its abuse. If reformers are unfair in their claim that alcohol can never be a food, their opponents are equally so in their exaggerated statements concerning its nutritive powers. Its use is often defended on the ground that it is a food, when the real motive for its employment is to obtain its cerebral effects.

Viewed as a drug, alcohol has certain positive properties. In faintness it often proves an effective restorative. Its virtue in this instance springs from its prompt influence upon the nerve centers governing the heart and the blood vessels. The circulation is quickened. Its most marked property is seen in the increased blood flow produced in the skin. This effect accounts for the sensation of warmth and tingling which follows the taking of two or three glasses of wine. And it is in this connection that we ought to call attention to a common misunderstanding. The feeling of warmth is due solely to the state of the surface of the body; it gives no clue to internal conditions. Now when the skin is filled with swiftly flowing blood one is certain to feel warm, but it is at such times that the heat is actually passing most rapidly from the body. If the air outside is cool, the comfortable glow produced by alcohol must be maintained by a prodigal expenditure of internal heat. Hence such an effect can be but temporary. Prolonged exposure to wet and cold is better sustained without alcohol, even if the discomfort is made keener by the abstinence. A chilled surface means economy of heat waste and the husbanding of fuel for continuing trial. Alcohol may be used to lessen the misery of a short exposure to intense cold, but should be avoided in cases where the hard conditions are to be borne for an unknown length of time. It is better, in general, to suffer than to depend on this treacherous support.

The increased blood flow in the skin which is so striking when alcohol is taken certainly tends to relieve internal congestions. There is no question that this is an action of great value when the object of the dosing is to ward off a

cold or some more serious effect of exposure to the weather. It may even serve to check the onset of such troubles when the first symptoms have appeared. It is useful in intestinal disturbances where the correction of congestion is again the main factor in the cure. For the best results the patient must have rest and warmth, preferably in bed, during the treatment.

We have now to speak of alcohol as a "mental alterative." The term has been chosen rather than "cerebral stimulant" for reasons that may appear. Whatever else is claimed, the effect chiefly sought in drinking is upon the brain. This effect is generally but inaccurately described as stimulation. But a stimulant is best defined as an agent which increases working capacity. Alcohol probably does this for the stomach, as possibly it does for the heart and the muscles in general, though the reaction follows soon. Its influence on the mental processes is scarcely to be regarded in the same way. A true stimulant for the brain should increase the power of sustained attention and consecutive, orderly thinking. Few would claim for alcohol such a property as this. The word "dissipation," which we use for intemperance, is a very precise one. Scattering rather than concentration of thoughts is the mental habit from first to last. Perhaps a man may be at his best socially when he is not at his best logically. There is a degree of attractiveness in the workings of a slightly inconsequent mind. We are amused by unexpected associations. A little alcohol lessens self-consciousness, with the result that the subject speaks without reserve and without confining himself to what is important. Conversation is diluted with trivialities. We may admit that this is somewhat enlivening.

But how much the animating potency of wine at banquets is overestimated! There is a simple reason for its undeserved reputation, and this is found in lowered standards of judgment on the part of those who listen to what is said. The ready laughter and applause do not indicate brilliancy

on the part of the speaker nearly so often as readiness to be amused on the part of the hearers. In the midst of such a company the total abstainer feels an amazement verging on disgust as he observes the demonstrations that greet speeches which in themselves are wholly inane and commonly in bad taste. How feeble are the sallies when recalled in "the light of common day"!

The justification of the social use of alcohol must be based on its power to produce this peculiar frame of mind. It removes the consciousness of fatigue and the feeling of care. The attention is limited to the present moment and immediate interests. The faculty of discrimination is dulled, and with the consequent lowering of æsthetic and intellectual ideals there comes a bland self-satisfaction and a naïve admiration for one's fellows. A vigorous writer has called this process "drugging for delectation." Can such an artifice be defended? It is most difficult to answer this question with entire justice to both sides. Perhaps it may be impossible to answer it in sweeping fashion for all men. One who is cynical and pessimistic by nature may really view his affairs more justly and judge his neighbors more equitably while under the influence of wine. This may be true of other temperaments, the neurasthenic, for instance. But the optimist — and may we not say the normal individual? — is not likely to be improved by such an agency. Increased buoyancy and good humor in such subjects mean silliness. If it is true that gatherings of total abstainers are comparatively doleful — as is claimed — the lesson may be, not that alcohol is necessary to good fellowship, but rather that the average nervous system is below par. We doubt whether a man ought to rest content with any lower measure of health than that which will insure the social virtues without chemical aid.

With advancing age it may be unreasonable to demand so high a standard. With increasing infirmities there must usually come a time when comfort rather than efficiency is

to be sought. When it is clear that such a time has arrived there is much to be said in favor of the more or less regular, moderate use of alcohol. It is a great anodyne. Granting this, we may also point out that the beneficent effect in age will be more easily obtained by those who have not exhausted the consolations of alcohol in earlier years.

It seems hardly necessary to dilate upon the poisonous properties of alcohol. That these have been ridiculously exaggerated is obvious: that they are very real is equally clear. The spectacle of drunkenness and the shame and misery that attend it are too familiar. No one who begins to use alcohol can be quite sure that he will always keep within bounds. The temperate lives of his relatives cannot be assumed to prove that he is secure. Susceptibility to the temptation to increase the indulgence is found again and again in young men of clean heredity and high gifts. Hence the only *absolute* safety is in total abstinence. Still, the chances do *not* favor the ruin of the average man who adds alcohol to his diet.

Enough has been said to show how various are the aspects of alcohol. It has been easy to treat them separately in the preceding paragraphs, but no such separation is possible in practice. The undoubted value of the alcoholic relish, its occasional merit as an actual part of the ration, and even its virtue as a drug cannot be utilized without some experience of its cerebral effect and the risk, not always remote, of forming a habit. The hygienic ideal to be sought is a robustness of life which shall make alcohol superfluous as relish, food or drug, and a cheerful, active mind which needs no artificial aid to make it hopeful and sympathetic. The attainment is no easy task. Grief and worry and overwork may be added to an original temperamental difficulty. But the use of alcohol is never more unsafe than when sorrows are the excuse, and never so selfish and cowardly as when the motive is to shun responsibilities that ought to be met. Men do not often see the sinister suggestion in the high

spirits of one who has forgotten his cares for an evening by the most moderate drinking. They do not see that the banished sense of pressing duties is the very characteristic of the drunkard when, developed to a logical extreme, it makes him indifferent to every obligation of conscience and of love.

PERCY G. STILES, PH.D., Simmons College.

DISPOSAL OF MUNICIPAL REFUSE

The latest branch of sanitary engineering which is being developed in our country is the municipal collection and disposal of the solid refuse as distinguished from sewage. In the smaller cities the refuse is either partly disposed of on the premises or dumped on low ground near by, or burned; or the garbage alone is collected by farmers and fed to swine. But in large communities the greater length of haul to suitable points of disposal, and the length of time that elapses until those matters which rapidly become offensive can be effectively disposed of, have lately caused the whole subject to be carefully reconsidered.

It is here intended to briefly review the question and to indicate the lines along which this municipal service is being improved.

The solid refuse consists of garbage, ashes, rubbish, street sweepings, night soil and dead animals. It is not intended to include the latter two classes in this discussion.

Garbage is, in several respects, the most important part of municipal refuse. It comprises chiefly the food wastes from kitchens, markets, and includes also the slaughter-house refuse. It consists almost entirely of organic matter and moisture. The animal matter contained in it rapidly breaks down and putrefies and, therefore, soon causes offensive odors, as the oxygen in the air is not sufficient in quantity to

prevent putrefaction, particulary during moist and warm summer weather.

Among the different classes of refuse, garbage, when it is fresh, has the greatest commercial value, because it contains animal food. It also contains about three to four per cent of grease, which is sufficient, under suitable conditions, to pay for its extraction.

If not cared for properly, garbage creates a greater nuisance than any other refuse, and its treatment has been discussed most frequently. There has been more difference of opinion regarding this treatment than that of any other class of refuse.

Ashes comprise the mineral waste left after the combustion of coal. The amount varies, of course, with the season, and also with the latitude, more ashes being produced during winter than in summer, and more in northern than in southern latitudes.

Ashes contain a large amount of unburned coal, which also varies greatly in quantity. From the average dwelling houses in the United States it is found that about twenty-five per cent of the ashes is unburned coal.

The objectionable part of ashes is the dust, which is apt to become a nuisance when the wind is brisk and when the receptacles or carts are not properly covered.

Rubbish is usually designated as the material which comprises everything that is not either garbage, ashes, street sweepings, manure or night soil. It contains a greater variety of materials than any of the other classes of refuse, and varies greatly in quantity.

Street sweepings is the material removed from the street pavements, and consists chiefly of horse droppings and of dust which settles upon the pavements, or is created by the traffic. Under this heading we often also class the manure collected at stables, and also the snow falling upon the streets, which, however, will not here be considered.

In discussing the proper collection and disposal of municipal

refuse we must consider all questions concerned from three points of view, health, nuisance and cost. If we can satisfy the general demands under these three heads the problem has been properly solved.

Health is affected by pathogenic germs, which may be contained in the refuse.

Ashes are quite free from them because they are the result of combustion. Garbage should not be considered as dangerous from the standpoint of health, because it consists of kitchen refuse where disease germs would not be found, except in the rare instances of diseased meats or vegetables which may have been improperly brought into the kitchen.

Street sweepings and manure are more dangerous because they may contain disease germs, particularly when the sweepings come from densely inhabited parts of cities.

Rubbish may be the most important part of municipal refuse from a health point of view. It contains the sweepings from houses where perchance there has been sickness or death; it may contain discarded bedding upon which there may have been death, and discarded articles which may have been in use by diseased persons. It is, therefore, to be looked upon with suspicion, and its safe disposal should be most carefully undertaken.

Nuisance is caused generally by the material being mal odorous or offensive to sight.

Garbage, if not removed in summer within twenty-four hours, becomes foul and objectionable. Ashes are liable to be a nuisance while collecting and dumping from the dust which the wind blows about.

Rubbish has generally no bad odor. But it can be a nuisance from its objectionable appearance when dumped promiscuously upon fields, allowing paper, straw and other light materials to be blown about and disfigure the ground in the neighborhood.

The *cost* question is an equally important point for the engineer to consider. He might recommend an entirely

efficient disposal to subserve the conditions required for health and for preventing of nuisance, but it might be at an expense which the community cannot afford. He is, therefore, required to advise the least expensive method of preventing sickness and nuisance, due to the collection and disposal of the various classes of refuse which have been enumerated above.

As the element of cost is essential, we must appreciate that a final disposition which requires long hauls for collection and delivery may be more expensive than another one which requires a short haul. The question of haul must, therefore, be considered together with the method of disposal, and may often determine the character of the latter.

The cost element must likewise decide whether the collection and disposal shall be separate or mixed.

We shall now briefly indicate the least expensive methods which can be employed to dispose of each of the different parts of refuse separately so as to prevent sickness and nuisance.

Ashes can always be used for filling and for road making, or mortar when in proper condition.

Garbage, if kept free from refuse and if collected and delivered promptly, can be fed to swine without endangering their health or creating a nuisance. It can also be plowed or dug into the soil, which, when freed from metals and large entangling objects, is quite a satisfactory disposal. If the soil is sand or acid, an improvement of the same is obtained.

The extraction of grease has also been more or less successfully conducted in many of our cities; but as a nuisance cannot always be prevented in the process, the reduction works should be, and usually are, located at isolated points.

Cremation or incineration is another method of disposal. As garbage contains from seventy to ninety per cent of water, it is not self-combustible. It is necessary to add a marketable fuel, such as coal, oil or gas, which generally raises the cost to a prohibitory degree. It is, therefore, more customary

and economical to mix the garbage with other more combustible refuse, as stated below.

Rubbish. Its usual disposal is largely by dumping. It is sometimes incinerated, but dumping is still most common, which is an objectionable process. The possibility of conveying disease germs is great, and if used for filling its lack of compactness causes it to settle for many years, so that meantime the land cannot be utilized for any other purpose. The best and only sanitary disposition for the rubbish is to burn it in furnaces specially built for the purpose. By properly conducting the incineration all disease germs are destroyed and all nuisance can be prevented.

Street Sweepings and Manure. Street sweepings and manure can be dumped for filling low land, and in many cases this disposal has been quite satisfactory. Where they contain sufficient manure to be combustible, they have been burned. Danger to health and nuisance can be prevented by a proper method filling or by burning.

When it is found that incineration can economically dispose of several or most of the above parts of the refuse, it will be most economical to mix them and burn them in a single furnace. This is done successfully, for instance, a at Westmount, Montreal; Vancouver, British Columbia; West Brighton, N.Y., and Seattle, Wash.

In conclusion it should be repeated that in order to decide upon the best system for any city, it is necessary to ascertain, first, the cost of each sanitary and practicable kind of disposal; and, second, the cost of collection and delivery to the respective point or points of disposal. The least expensive combination will indicate the system to be preferred.

RUDOLPH HERING.

THE AMERICAN HEALTH LEAGUE

All sanitarians must be watching with interest the active educational and political campaign which is being carried on by the American Health League. "The public health" is a phrase to conjure with, and public sentiment can be aroused to almost any pitch by popular agitation for prolongation of human life. It is doubly necessary, therefore, that this powerful engine for good should be wisely used.

With regard to methods, it is of great moment that the present waste of life capital and the possible improvements due to sanitary reforms should be fairly and moderately stated. Overestimates of the extent of existing negligence and of the power of potential remedies tend to react against the whole cause of sanitation. Furthermore it is important that a sense of proportion should direct the preparation of educational literature along these lines. There is danger that undue emphasis may be laid on certain sanitary dangers, to the neglect of others of far greater consequence. The pure food agitation, for example, must find its main justification on economic and moral rather than sanitary grounds. There is only a certain amount of energy and money which can reasonably be demanded for sanitary progress in the coming decades. It is essential that this should be wisely focused on those points where a maximum result can be attained.

Again, in regard to the ultimate objects of the sanitary campaign it is clear to professional sanitarians that efficient local organization is the thing to be aimed at rather than Federal regulation. The Public Health and Marine Hospital Service is doing splendid work in studying the problems of the District of Columbia, in investigating scientific questions bearing on sanitary science and in disseminating the

information it acquires. This bureau should be strengthened for the functions of research and education. It might perhaps, as has been suggested, receive an appropriation equal to that so wisely expended by the Department of Agriculture. There is a sharp line, however, between advice and control. Sanitary control must, from the magnitude and variety of the problem, be a local matter. The suggestion that the milk supply of the United States should be inspected and pasteurized by Federal authorities is so chimerical that it tends to discredit the whole movement for sanitary reform.

The important problems of sanitation are local problems. The reform of water supply and sewage disposal systems is beginning to be well handled by State authorities; and interstate questions can be competently dealt with by coöperation of the States (as New York, New Jersey and Pennsylvania are at present coöperating). Efficient health administration in cities and towns (perhaps in counties in the rural districts) is the great desideratum for dealing with housing and factory sanitation, with milk supply and other food supplies, with the prevention of excretal pollution, with disinfection and the isolation of disease. No greater service could be done by any public-spirited citizen in furtherance of sanitary development in this country than the organization in local branches of societies for the moral and political support of local health authorities, especially those who have developed themselves as professional hygienists, for an immense amount of accurate information and progressive administrative ability is now unused in such places because of the lack of public opinion to indorse and carry through reformatory measures. This is perhaps the greatest lack which can be supplied in any way by lay effort at the present time in hygienic circles.

C.-E. A. WINSLOW.

THE REVIVAL OF FIELD INSPECTION

With the rapid development of sanitary work and the tremendous demands made by the public upon the health departments of the country, it has been impossible to appreciate at their proper value each specialized department in sanitary lines. The men demanded by the immediate pressing obvious necessities have naturally been trained first, such as executives, vital statisticians, engineers and laboratory workers, but only in limited numbers the field men. It is gratifying to see that an effort is now being made, by some departments at least, to train the field man for the various duties connected with this work, and that it is gradually becoming recognized that highly trained men are as necessary for field work as for office or laboratory work.

The field information in reality sets the foundation for the analytic and statistical work to follow, and naturally should be secured with the greatest of care and by individuals trained along this special line of work. Take, for instance, the study of a sanitary water problem. Good field information is of vital importance, since it shows the actual existing conditions in the specific case in question, and such field information must be used as a basis for the conclusions drawn from the bacteriological, chemical and physical examinations of the samples collected, if specific and definite conclusions are to be reliably reached. The tendency, which developed at the beginning of analytical water work and in some cases has continued to the present day, is towards a neglect of the field data to back, account for or explain the conclusions drawn from the analyses. The initial step was in the direction of *getting the sample*, regardless of who collected it or who supplied the necessary information, and then

immediately proceeding with the analyses, on which alone the report was almost entirely based. The evils of the disregard of field data may readily be shown. If the presence of *B. coli* in water, for instance, indicated clearly in every case the exact origin of the bacillus, no field data might be needed to condemn a supply in those cases where simple bacterial analysis showed *B. coli.* But it is not true that "*B. coli* present" always means serious contamination. A careful examination of the surroundings often demonstrates clearly that the *B. coli* present was derived from animal sources rather than from man, in which case a different conclusion should be given. The collection of field data together with the proper collection of a representative sample, either chemical or bacteriological or both, is a study by itself and should not be assigned to untrained hands. The indiscriminate distribution of sampling outfits, both bacteriological and chemical, to individuals who have never before collected a sample is certainly unsatisfactory, to say the least.

The reason given for not sending properly trained men to do the obviously necessary field work whenever the investigation demands it is in most cases credited as economic, but the continued use of such methods is surely poor economy. It is easy to see that the erroneous condemnation of a single water supply will quickly offset the necessary expenditures for many proper investigations. Let us hope that the day is past when the man sent into the field for duty is not merely that member of the staff whose time is least occupied on the day of need, regardless of his training.

What applies to water investigations applies also in work on epidemiology. This line of investigation alone presents room for a lifetime study. The problems involved in securing and interpreting the necessary data on which to base conclusions become extremely complex. Each investigation will probably require an entirely different line of study. The location of the source of infection may involve much more

than the mere listing of the cases and the study of their relation to various foci of contamination. It may necessitate a detailed sociological and economic study of the people involved. So again we have a field problem requiring a man especially trained for the work. It is impossible to conceive of one individual being trained to cope with all field problems, so this necessarily means a division of the work. This division of work naturally means the introduction of the specialist who is in a position to deal with his specific line of problems intelligently. Public health work must necessarily, sooner or later, develop this specialistic side in field work as in all others as the demands increase, and certainly the public will benefit tremendously by such a development.

H. A. WHITTAKER.

Editor's Note. — This editorial gives opportunity to suggest a subject distinct from that treated above, yet somewhat parallel. In many municipalities extreme need exists for a revision of the ordinary bureau of "sanitary inspection," often in the personnel, often in the organization of the bureau, but most often and of chief importance in the training of the inspectors themselves. When it is remembered that the contact of the ordinary citizen with the health department — all that the ordinary citizen ever learns by personal experience of the existence and work of the health department — is based upon dealings with the sanitary inspector, it is not astonishing that the public should have formed in many cities a very low estimate of health department efficiency. An eminent health authority may be commissioner, highly-trained men may act as medical inspectors, epidemiologists, vital statisticians, laboratory workers and engineers, but if the standard of the sanitary inspector is low, the ordinary citizen, knowing nothing of the former, but in daily contact with the latter, cannot be blamed for the skepticism too often found prevalent amongst the mass of citizens as to the knowledge, capacity, power and willingness to act of the ordinary city health department

SPECIAL ARTICLES

A SIMPLE PROCEDURE FOR THE DISINFECTION OF PASSENGER COACHES AND TO KILL VERMIN IN THEM

By JOHN A. AMYOT, M.B.
Toronto, Canada

The disinfection of railway coaches is usually incomplete, and much difficulty is experienced in killing insects, especially in the cars of suburban lines.

Formaldehyde, from commercial formaline, is the gas best suited to disinfect, aërially, rooms and such places. Hydrocyanic acid generated from the decomposition of cyanide of potassium by a mineral acid, has proven the most efficient material for killing vermin, such as bedbugs, fleas, lice, cockroaches and mosquitoes. In order to use these substances efficiently, it is necessary that the rooms be so well closed that there is practically no loss of gas, so that a sufficient exposure to a sufficient concentration of the gases be obtained. For formaldehyde disinfection a temperature of from 60° to 70° F., and a relative humidity of at least 70 per cent at the temperature of disinfection are required. In passenger coaches, on account of the many windows, doors, ventilators, pipe openings and various other fixtures, it is next to impossible to make them gas tight and to secure regularly the requisite humidity. All of these difficulties could be overcome by placing the car in a practically air-tight house, one that could be cheaply built of light framing and corrugated iron externally, and with tin or galvanized iron soldered at the joints to make it air-tight. This need not be much larger than the ordinary coach. It could be

made large enough to receive two or three coaches, if such be desired. It would be an inexpensive structure. The door only need give any trouble to complete closure. The car or cars placed in this chamber may have all of their doors and windows opened wide. The requisite amount of humidity in the air could be secured by ordinary sprinkling pipes being attached to the sides of the chamber some eight or ten feet from the floor. Water dripping down the wall and down to the floor and left there for fifteen or twenty minutes would very soon bring the air up to the humidity required. The water then could be run off towards a sump hole, which could very easily be drained over to a sewer. An ordinary steam coil would give the required temperature. A chamber at the side of this disinfecting house could be placed in which the formaldehyde could be liberated and driven by fan into the disinfecting house. The chamber would also serve the purpose of an observation look-in. A couple of small fans in this house could be placed so as to mix the formaldehyde and air uniformly throughout the chamber. The gas would then reach all parts of the exposed bedding, cushioned chairs and seats, the inside and outside of the car and lavatories as well, with the least amount of gas expenditure. The exposure could be made as long as desired. An hour would serve all purposes. The formaldehyde, which is so objectionable in odor, could then be removed very rapidly by a suction fan at one end of the chamber and an inlet fan at the opposite end. Both of these, while disinfection is going on, could be kept closed off to prevent loss of gas. To kill vermin the cyanide of potash could be decomposed in the same chamber as the formaldehyde was liberated from, and by the same fan be driven into the fumigating house, and when the half-hour's exposure had been complete could be pushed out and drawn out by the fans mentioned for the extraction of the formaldehyde gas. In this way perfect disinfection and complete insecticidal action could be secured at a minimum cost of apparatus, material and building.

MEASURES TO PROMOTE THE HEALTH OF SCHOOL CHILDREN *

MARSHALL LANGTON PRICE, M.D.
Secretary State Board of Health of Maryland

School children deserve especial consideration from hygienists mainly for three reasons: fiirst, age; second, conditions of overcrowding and close contact; third, special conditions connected with education. The educational period may be regarded, as far as school children are concerned, as extending from the fifth to the fifteenth year. This age period is unique from a hygienic standpoint for two reasons. At the age of five years an individual should have his greatest expectancy of life, considerably greater, in fact, than he has at birth. In this period we find a lower mortality rate than at any other period of life. On the other hand, in this period we find generally the highest morbidity rate, and this morbidity is almost wholly due to communicable and hence preventable diseases. The great bulk of these diseases among school children can be divided into the minor infectious diseases, especially acute exanthemata, and the more serious chronic diseases, which seldom become manifestly evident in school life, but exercise serious effects on the after life of the child. As the educational period is the largest determining factor in the future efficiency of the child's mind, so the school period is the time during which the future efficiency of the body is decided for good or bad. "As the twig is bent so is the tree inclined," and this is as true of the body as it is of the mind.

Hygiene, as taught in the public schools, is a sinister

* Read before the American Public Health Association at Winnipeg, August, 1908.

practical joke. The cursory and indifferent attention paid to hygiene can be evidenced by any school curriculum. The garbled and inferior text-books are devoted largely, in many States, to the effects of alcohol on the human system, with a calm and magnificent disregard for the urgent problems which enter our daily life, such as the prevention of tuberculosis, typhoid fever and acute infectious diseases. No one familiar with the subject can deny that the State has failed lamentably on this urgent and fundamental principle of education. The hope for future hygienic progress, not only for school children, but for the community at large, must lie in the education of our future generations to such a knowledge of self-protection against death by disease as they now have against death in its obvious physical forms. The remedies are self-evident, and can be briefly stated.

First, to teach real hygiene in schools, by teachers who have a thorough knowledge of the facts, and have the rare ability to impart them to the minds of children. Second, to sweep our present farce out of the schools, and consign it to the junk heap, where it belongs. In this enlightened and progressive age we have no right to give children dead and mummified superstitions as the living truths of hygiene. I think we, as health officials, are now all awake to the importance of hygienic education for the public, but we have, as a class, been slow to grasp the fact that we must make our impression at that time when the mind is "wax to receive, and marble to retain." And we must all never fail to reiterate the fact, which all human history has shown, that advance in hygiene cannot very far proceed the enlightenment and intelligence of the people.

I will refer briefly to the medical inspection of schools. The most serious defect in medical school inspection is paying physicians small salaries to do patchwork. Specialization in work of this character is no longer merely advisable, it is imperative. Medical school inspectors can, at present, only be expected to recognize obvious acute diseases. No one

can deny the importance of even this form of imperfect inspection, but it is not to be compared in importance with the recognition of latent and chronic disease. The school period is the period of latency for many serious chronic diseases, first of which in importance is, of course, tuberculosis. The vast majority of these diseases could be arrested before their development if proper methods were instituted as soon as the diseases were recognized. Special schools should be established for children with bodily or mental defects, the latter under the control of an expert psychologist. In the case of eye defects, a special school should be provided where the lighting facilities are abundant, special type provided for books, and frequent periods of rest interspersed among the school hours. It is both cruel and unscientific to try and force children with such serious handicaps through the same course of instruction that is applied to sound children. Children with defective hearing should be instructed in small classes in rooms of good acoustic properties, and proper use made of graphic methods of instruction. We are only beginning to realize the constant mental and nervous strain imposed on school children with defective hearing.

Evident tuberculosis is generally uncommon among school children, with the exception of tuberculous bone disease, but it is only the trained expert who can realize how common latent tuberculosis is among school children. It is important that these latent cases should be recognized, both on account of the children themselves, and on account of those exposed to them. Because latent tuberculosis is discovered in a child, there is no reason why such a child should not receive an education, not only without physical injury, but often with actual benefit. For this class of cases out-of-door schools should be established, in parks or suburbs, the children taught in small classes, for short hours, with frequent intervals of rest. Rigid desks and chairs should be abolished for this class of children, and comfortable easy-chairs used, to allow rest and relief from bodily strain. Serious diseases

and defects could be prevented in later life by keeping careful anthropological data concerning each child, and by transferring those showing improper bodily development temporarily to special schools.

Because it is universally neglected, I am referring specifically to "school hygiene," which includes such general problems as heating, lighting and ventilation, exercise, rest and recreation, water supply, and the spread of communicable diseases. The hygienic principle most outraged in our public schools is proper ventilation. Through reasons of economy and convenience, the children are crowded into schoolrooms in numbers three, four, five and even ten times in excess of what their health demands.

The greatest general evil in school life is promiscuity. This is natural to children, and it is unfortunately encouraged under our present school system. Several of our States have laws providing for the issue of free schoolbooks, which are passed around among the scholars until they become so dirty and torn that not even a child will willingly handle them. The issue of free schoolbooks is so little of a blessing that I would gladly see them abolished everywhere, as more than any other factor in school life their principal function is the conservation and propagation of disease.

Probably next in order in efficiency in propagating disease is the public drinking fountain or water cooler. It has been found, on our naval vessels, where the conditions of overcrowding and promiscuous intercourse are similar to those obtaining in schools, that it is impossible to prevent the spread of acute infectious diseases as long as common drinking vessels are employed. To meet this condition individual drinking cups, jet fountains, or the sterile pipette system should be adopted A proper place should be provided for children's lunches,—a clean place screened against flies, — and it should be made a violation of school discipline to exchange articles of food as well as wearing apparel, slate pencils, slates, sponges and other articles

of personal use. The hygienic evils inevitably connected with the school life should be realized and met actively and vigorously, and not with passive supineness. The evils of overcrowding should not be intensified by building schoolhouses in narrow, dark alleys or streets. Every public school should mean a public park, whether under the control of the Park Board or the school authorities. The hygienic arrangements of each school should be subjected to rigid inspection, as this in itself would have important educational value. These simple principles are not extravagant or impracticable, and I believe that our generation will see the majority of them actually accomplished. We have enacted laws regulating child labor because industrial conditions are recognized to be harmful to the bodily development of children. Let us, at least, see that the children that we have removed from shops and placed in schools, are under hygienic conditions at least as good as those from which they have been removed.

MEASURES TO PROMOTE THE HEALTH OF SCHOOL CHILDREN *

By SAMUEL G. DIXON, M.D.

Commissioner of Health of the Commonwealth of Pennsylvania

At the last session of our Legislature the opponents of vaccination, represented by a paid lobby, were putting forth strenuous efforts to convince the legislators both of the futility and the danger of vaccination. Their efforts, I regret to have to say, were so far successful that they were able to procure the passage of a bill to repeal the law making vaccination a prerequisite to admission to school. Fortunately, however, Pennsylvania had a chief magistrate who was not to be swayed by either popular clamor or cheap sophistry, and who set the seal of his condemnation on this action, and thus saved the Commonwealth from a great calamity.

The work of protecting our school children from the scourge of smallpox has, therefore, gone steadily on and, with very few exceptions, with the approval of our people.

Any one who carefully examines the official compilation of the common school laws of Pennsylvania cannot fail to be impressed with the fact that the State, while recognizing the prime importance of the education of the minds of her children, is, at the same time, deeply concerned for the preservation of their health and has, therefore, made it the duty of those who are intrusted with their instruction also to use every possible reasonable means of training up a sturdy

* Read before the American Public Health Association at Winnipeg, August, 1908

and vigorous, as well as intelligent race of citizens. I presume she is by no means alone in this particular.

This care begins with the construction of schoolhouses, which are required to be of sufficient number, in healthful locations, comfortable, well heated and well lighted, providing at least fifteen square feet of floor space and two hundred cubic feet of air space for each pupil, and warmed to maintain an average temperature of 70° F. in the coldest weather. An abundant supply of water "for fire and sanitary purposes" as well of pure water for drinking must be assured. The sanitary conveniences must be properly constructed, kept clean and free from offensive odors, and arranged with due regard for the morals of the children.

As the aggregate intelligence of the State is superior to that of the average parent, it naturally adopts a higher standard for the care of the child's health than that of the average parent. Especially is the law careful to protect the children from contagious diseases. The teacher is required to exclude from school not only every child suffering from such diseases, certain of which are specified, but also any child or person belonging to or residing in the same house in which any person may be located who is suffering from any of said diseases, and such exclusion must continue for a sufficient period following the discharge by recovery or death of the person last afflicted in said house or family, or his or her removal to hospital, and the thorough disinfection of the premises.

The directors in cities are also required to disinfect the schools at regular intervals.

In order to maintain the health and bodily vigor of the pupils, calisthenics and athletics are made a portion of the training, and in order that the pupils may understand the importance of the proper care of their bodies, physiology and hygiene are part of the regular curriculum.

When, by reason of distance of the schools from their homes or inaccessibility, the children would be subjected

to too great fatigue or exposure in going to and from school. the directors are authorized to provide conveyance for their transportation.

I take it for granted then that sanitarians, physicians, legislators and school directors are all alike agreed that proper ventilation and heating, a sufficiency of air space, an abundant supply of pure water, proper sanitary appliances and clothing accommodations are essential measures for promoting the health of school children, and shall not return to them again. Rather would I call your attention to hidden dangers to health which are too often ignored or neglected.

A second important means for promoting the health of school children is the immediate reporting of all cases of communicable disease to health officers by physicians. It then becomes the duty of the health officers to at once investigate the school relations of families in which such diseases are reported to exist, and to notify the teachers of all schools which are thus in danger of infection, whether by reason of the attendance of other children from the same families, or of books or other articles having become infected by the child whose illness is reported.

One communicable disease I desire to mention with especial emphasis because its presence in schools is not sufficiently recognized. I refer to tuberculosis.

Dr. John Lovett Morse of Boston has stated that large series of autopsies in children show tuberculosis in from twenty-five per cent to thirty-five per cent.

Kirchner, in a recent table based upon Prussian statistics, shows that a sudden increase in tubercular mortality commences at the fifth year and progresses rapidly, showing that in that country, at least, "certain conditions enter into the child's life during the school period which enormously increase the risk of dying of tuberculosis." Many of the inscrutable nameless fevers of childhood are due to tubercular glandular affections.

In the *London Lancet* for Dec. 28, 1907, in a paper by Drs.

Lecky and Horton, entitled "Revealed Tuberculosis in Children," it is stated that in the city of Brighton in the three years, 1904, 1905 and 1906, the annual notification of cases of pulmonary tuberculosis, between the ages of four and fifteen, was at the rate of 190 per 100,000 of population, which would be almost two per cent of the population at school ages. Unfortunately, beyond that age all deaths are computed together, so that it is impossible to determine the rate among the older school children. The number of deaths, however, is small, which bears out the theory that when the disease is discovered in its incipiency in child life it is very amenable to treatment; but this is offset by the fact that the number of deaths from other forms of tuberculosis at that age was comparatively large.

In the town of Blackburn, 1,028 school children were referred to Dr. A. Greenwood, the Medical Officer of Health, by the school attendance officers, for determination as to their fitness to attend school. Of these 11.8 per cent were found to be suffering from tuberculosis. This investigation covered a period of three years, from 1903 to 1906. During the first year the tuberculosis percentage was 16; during the second, 6.8, and during the third, 12.5. Of these cases 6.7 were pulmonary, and 5.1 per cent of other forms.

In the *Journal of the Outdoor Life* for May, 1908, Dr. Ellen A. Stone, Medical Inspector of Schools of Providence, R.I., in concluding an article describing the Fresh Air School in that city, pertinently says: "In the light of the amount of tuberculosis found at autopsy in children dying of other diseases and from accident, we must recognize the fact that many school children are carrying about hidden foci of this disease, and is it not probable that those who are suffering from anæmia, debility, etc., are likely to be the ones?"

In the city of Cleveland, out of 500 children examined, twenty per cent show by physical signs that ganglio-tuberculosis exists.

Roux and Josserand found forty-four per cent of school

children examined in Paris and Cannes were tuberculous. A European observer declares that:

"From the third to the fifth year tuberculosis occupies a fourth place with reference to causes of death.

"From the sixth to the tenth year tuberculosis occupies the third place.

"From the eleventh year on tuberculosis occupies the first place."

I confess that these statements appeared to me exaggerated, and I was inclined to doubt whether they would be borne out by figures gathered in this country. I therefore consulted the statistics of my own State on record in our own Bureau of Vital Statistics, and to my surprise found that they fully sustained the reports of European observers. In the year 1906, out of 9,258 deaths from pulmonary tuberculosis, 1,456, or more than fifteen per cent, were of persons under twenty. If the deaths from tubercular meningitis, marasmus and tubercular diseases of the bones were added, the percentage would be considerably increased, although not always, it is true, by children of school age.

Of children over five years of age and under nine, 89 died; of those between nine and fourteen, 166; and those between fourteen and nineteen, 784; showing a most alarming increase during the latter period of school life.

The comparative mortality from the other contagious diseases diminished with corresponding rapidity, just as in European countries, until in the later five-year period of school life only 44 died of diphtheria, 19 of measles, 11 of scarlet fever, and 2 of whooping cough.

Brouardel states that one-fifth of the teachers of Paris are tuberculous. I cannot believe that this condition would be revealed by an investigation in our own schools; but we owe it to our children that an investigation of this question should be made.

Tuberculosis in children is, fortunately, very amenable to treatment. "It is, in fact, very susceptible both to favor-

able and unfavorable influences, so that," as Dr. Lowman says "it is a fair inference that unhygienic conditions must be reckoned among causes of the disproportionate increase of cases during the school years."

From our present knowledge of the conditions essential to the cure of this affection, we are warranted in the conclusion that overcrowding and lack of ventilation are potent factors in bringing about this unfortunate result. Lowman says, and you will all agree with him, that "the transition of a child from a free, unrestrained life in the open air to a room deficient in oxygen and with an excess of carbon dioxide, must have an unfavorable general influence." But even more dangerous than the gaseous carbon dioxide are the organic effluvia which are given off from the lungs and body.

Up to the tenth year the health of all the children should be the object of special solicitude because of the frequency of tracheo-bronchial tuberculosis, while from the tenth to the fifteenth year special attention should be directed to the increased danger from pulmonary consumption; but I trust that enough has been said to convince you that tuberculosis, or consumption, is a very real peril to our school children.

An examination by an expert physician of such children as belong to consumptive families, or are living in the same house with consumptives, or suffer from persistent cough, or give evidence of gradual failure of health may, in many instances, discover the early symptoms of this fatal disease at a stage when it is readily curable. It can early determine, should such unhappy discovery be made, whether the disease is in such a stage as to be communicable, and thus make it necessary to exclude the child from school. It is just here that the Pennsylvania Legislature, at its last session, adopted a measure which will prove of the greatest service for protecting the health of school children through the Department of Health.

Up to the present time opportunities have not occurred,

even in large cities, and still less in rural districts, by which families in moderate circumstances could avail themselves of the services of an expert. The appropriation of the sum of $400,000 to the department for the purpose of establishing a Tuberculosis Dispensary in every one of the sixty-seven counties in that State, fully equipped with all modern means of diagnosis, and availing itself of the best medical talent in the country, puts a new aspect on the question. The teacher or school physician who is in doubt as to the character of the disease, in a child who is steadily deteriorating in health, will simply need to report to the parents and urge them to provide for the transportation to the country dispensary, always situated in the most accessible town in the country, in order to have the case decided, and also to have the best possible advice for curing the case should it prove to be as suspected. It is only in childhood that we can look forward with absolute certainty to the cure of tuberculosis.

There are other conditions, however, which, while they may not directly threaten the life of a child, interfere most seriously with his growing up to be a useful member of the community. Adenoids, defective hearing and defective vision all play their part in retarding children's progress in their studies. Every one knows the stupid, heavy expression of the child whose throat and nasal passages are filled up with adenoids, and how not only dull, but even depraved they become. We have all heard of the unhappy boy who voluntarily presented himself at a clinic, asking to "have them things cut out of his throat what made him tell lies." Not less hopeless is the condition of the pupil who fails to hear or see distinctly. Laughed at by his fellows, frowned on by his parents, punished by his teachers, at the foot of his class, he goes on bearing his heavy burden, sullen and despondent or wildly reckless, unsuspecting that he is not as other children are.

I would say, then, that the sixth measure is the systematic inspection of school children by a physician, supple-

mented in all large towns by the services of a school nurse, and where necessary and practicable by the skill of an expert in the diagnosis of tuberculosis. Such a system successfully inaugurated throughout the length and breadth of our continent would, I am confident, soon make itself evident in a noticeable narrowing of the broad swath annually cut through the columns of our school children by communicable diseases.

DISCUSSION

DR. JAMES D. LAFFERTY of Calgary, Alberta. Our rules and regulations in the province of Alberta, now ready for sanction, provide for the examination of school children twice a year by the municipal health officer, and in the outlying localities and villages by a paid health officer. In the cases of children whose parents, from poverty or any other reason, are not able to pay for medical attention recommended for the trouble or disability from which they are suffering, the treatment of them devolves on the municipality through the health officer; and in the outlying districts where there is not a health officer, but only a traveling inspector, who may see the child only occasionally, the responsibility of looking after that child and taking care of it is laid on that district, so that all children, whether the parents are able to pay for medical attention or not, receive medical care. We are providing for the appointment of medical inspectors, who shall give their whole services to the work of this department. When they receive the appointment they shall undertake to qualify, from time to time, in the various departments of sanitary science, and to the extent of being able to examine for visual defects and correct them, so that in a short time we expect each one of these inspectors to be a sanitary expert, and to perform all of the duties of a specialist.

DR. JOHN N. HURTY of Indianapolis, Ind. Very recently a woman complained that the sight of her elder

daughter was ruined in the schools or, at least, materially damaged, on account of insufficient and wrong introduction of light. She said that there was not a sufficient amount of light, and that eye strain had resulted.

Reflex nervous trouble had followed this eye strain, with the consequent reduction of nutrition, and finally the invasion of tuberculosis. Two physicians stand ready at any time to testify their firm belief that this impairment of health was brought about by the unsanitary conditions at the school she attended. The mother consulted a prominent attorney on the subject. He sent for the members of the State Board of Health for a conference, and the conclusion from high legal authority is that here is a case of assault and battery by the school authorities in a township upon a little child, and the mother has sued the township for $10,000 damages. If she succeeds in recovering damages in any sum at all, it will arouse the so-called practical business men to a realization of the importance of school hygiene. I have despaired of arousing the attention of practical business men to this great economic measure, one that is not only economic but humanitarian, except by some such means as damage suits.

HEALTH PROBLEMS OF PROVINCES*

By M. M. SEYMOUR

Provincial Health Officer, Regina, Saskatchewan

ABSTRACT

The province of Saskatchewan, containing as it does 250,000 square miles of territory, with a population of 300,000 people, which is being rapidly added to, has a great many questions with reference to public health which require careful consideration and dealing with.

One of the most important questions which we, in Saskatchewan, have at present to deal with is the preservation and prevention from pollution of our natural water supply. We have already had severe illustrations of the evils which follow from raw sewage being emptied into our rivers and streams. Fifty-six cases of typhoid fever were last year traced directly to the use of water from the Saskatchewan River, which had been polluted by a city emptying its sewers directly into the river.

You, in the older portions of America, know of the disastrous results from avoidable water contamination; you also know of the difficulties of having sewage systems changed after they have been once installed. I intend asking the Government for legislation to protect our rivers and streams. In order that this be done, I think that plans for water supplies of cities and towns, before being carried into effect, should be submitted to the Government for their approval. The same approval of sewage systems should be also insisted upon. The want of some supervision of this kind is already

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apparent in the serious mistakes which have been made by some of the places in Saskatchewan.

One town has recently built a reservoir for its drinking water beside one of the main streets in the place. This large basin is to be left unprotected from all the infected dust which may be blown into it from the adjacent street.

The importance of a supply of good water and proper sewage in lessening typhoid fever has been well illustrated in Regina, where, before the present system of water and sewage was installed, typhoid fever existed to an alarming extent, since which time the amount of the disease has been very small indeed.

The proper inspection and control of milk must be extended throughout the province, as milk is undoubtedly a very common carrier of typhoid infection.

The lessening of the restrictive measures previously in force in some of the States of the South, with reference to smallpox, has given us a few extra cases to deal with. Owing to the general dread which exists among the people, with consequently the easy way of isolating cases, and through the great efficiency and protective power of vaccination, smallpox outbreaks have always been in Saskatchewan very easily got under control.

Diphtheria has been a difficult disease to get under control in some sections, owing to the unwillingness to procure medical assistance and the endeavor to do away with the necessity of maintaining quarantine. These difficulties were principally experienced in the settlements of Menonites and some of the newer arrivals among the Galecians.

The Government supplies antitoxine in all cases where the people may be too poor to procure it themselves.

Some difficulty has been experienced in dealing with scarlet fever through medical practitioners allowing quarantine to be removed too soon; the quarantine law in our province for scarlet fever is from three to eight weeks, or until desquamation is complete. This has been interpreted by some

practitioners to mean that patients can be released from quarantine after the disappearance of the rash.

I now come to a disease of fearful importance on account of its enormous death rate, viz., tuberculosis. There were ninety-seven deaths reported in the province of Saskatchewan last year from tuberculosis. Statistics inform us that for every death which takes place from this disease there are five cases of infection left behind. This is well corroborated by the number of cases of tuberculosis which are at present being reported. This means that in the young province of Saskatchewan there are over 500 cases of tuberculosis, who are more or less in the position of invalids, and all, if they hope to recover, should be treated as such for a considerable length of time.

The mortality from tuberculosis is, therefore, a problem compared with which all other social problems of a medical character sink into insignificance, and it is safe to say that the possible prevention of a large portion of the mortality from this disease is justly deserving of the solicitude, the active, personal interest, and liberal pecuniary support of all who have the real welfare of the people of this country at heart

HEALTH PROBLEMS IN ALBERTA*

By D. G. REVELL, B.A., M.B.
Provinical Bacteriologist, Edmonton, Alberta

ABSTRACT

Alberta lies between Saskatchewan and British Columbia. It stretches from Montana on the south to Mackenzie Territory on the north, thus extending between the 49th and the 60th parallel of latitude. The eastern boundary is the 110th meridian. On the west the southern half is bounded by the summit line of the Rocky Mountains, while the northern half is bounded by the 120th meridian. It is, therefore, about 750 miles long and 380 miles wide in the middle, from which it narrows slightly north and south. The total area of the province is 253,540 square miles; for greater clearness I may say that the width of Alberta exceeds the distance from Buffalo to New York, and its length is greater than from St. Louis to New Orleans. Its area is just a little larger than the combined areas of Virginia, West Virginia, Ohio, Indiana, Michigan and Wisconsin. In other words, it is as big as four Michigans, five Wisconsins, six Ohios or seven Indianas.

This immense tract has an elevation of 5,000 to 10,000 feet above sea level in the mountains in its southwest part, and of 2,000 to 5,000 in its northwestern part. It descends to a level of 1,000 to 2,000 feet in the northeast, and 2,000 to 5,000 in the southeast. The general slope of the province as a whole is to the northeast, and the northern part is much less elevated than the southern. In round figures, the eastern side is about 4,000 feet lower than the western, but

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the descent is greatest near the mountains. The rivers, consequently, have rapid currents (in many places 5 to 10 miles per hour), winding channels and narrow valleys. There is thus not much time for natural agencies to remove any pollution to which the waters might be subjected; and it is, therefore, doubly important to maintain, as far as possible, their original innocence.

Almost without exception the rivers of Alberta have their head waters within the province. We are at the fountain head of the water supply of the Northwest. In the protection of the purity of her water supplies Alberta, therefore, has a peculiar opportunity as well as a very important duty.

Except by those who have experienced it, the climate of Alberta is largely misconceived, because people are so apt to think of climate chiefly in terms of latitude, whereas there are other potent factors. The swing of the pendulum of the seasons in high latitudes is governed chiefly by *temperature*, which in turn depends on the very variable length of the day; in low latitude the length of the day does not change much throughout the year; and the seasons are more largely a result of variation of amount of *moisture*.

In northern Alberta the hours of possible *sunshine* range from 19 *in June* to 5 *in December*. In the southern part of the province the range is from 16 hours sun in June to 8 in December. The period of nocturnal cooling varies inversely as the length of the day. In summer what is added to the length of the day is taken from the night. There is, so to speak, a shifting of the weights from one scale pan to the other. It is fairly true that the greater part of Alberta has a sub-tropical summer and a sub-arctic winter. The cold of the Alberta winter, however, is not felt at all as keenly as temperature comparison with eastern and southern places would suggest. The dryness, and especially the freedom from wind during "cold snaps," are doubtless the reasons for this. The climate, in fact, as well as the soil, is eminently suited to

agriculture, and while summer frosts have been and are the bugbear of the farmers, yet the history of the other provinces shows that these will diminish and disappear as the soil is more and more exposed to the sun's heat by cultivation.

The influence on the climate of direction of the mountains, of the lower elevation of the northern part of the province, and of the effect of the Pacific Ocean and the prevailing westerly winds is seen in the course of the isothermal lines. As these cross the continent they trend away to the northwest, so that Edmonton, in latitude 53½, is five degrees warmer than Winnipeg and Regina (both about latitude 50) in December, January, February and March; has the same average temperature in April and May; but is 5 to 10 degrees cooler during June to September; and is again warmer than Winnipeg and Regina in October and November. The northern boundary of Alberta is 10 degrees north of Winnipeg and has a mean monthly temperature just 10 degrees lower. The *average summer temperature* of Alberta varies from 55 degrees Fahrenheit in the north to 60 degrees Fahrenheit in the south; while the *mean annual temperature* is 25 degrees Fahrenheit in the north and 43 degrees Fahrenheit in the south.

The development of the Northwest has been carried forward very quickly within these opening years of the twentieth century, largely by the efforts of railway and of land speculating companies, aided by the work of immigration agents of the Dominion Government. This growth is well shown in the census returns for 1901 and 1906. During the intervening five years the cities in Alberta doubled, trebled and quadrupled their population. Five new towns and thirteen villages were formed, and the already existing ones grew from two to seven fold in size. This growth has been maintained since 1906, and the building of new railways makes it reasonable to expect a continuance of it, certainly in arithmetical if not in geometrical progression, for many years to come.

In 1901 Alberta had 73,000 inhabitants, of whom 52 per

cent were born in the province. In 1906 there were 185,000 people here, an increase of 154 per cent in five years. The present most conservative estimate of the population is 250,000 to 300,000, an increase of 35 per cent to 62 per cent in the last two years. The population in 1906 was made up of 74,000 foreigners and 111,000 British. Of these 87,000 were Canadian born, 38,000 were native Albertans and 30,000 were from Ontario, while 24,000 came from the British Isles. Of the foreign born 43,000, over 24 per cent of the entire population, were from the United States. Most of these latter are successful western farmers; many of them are returned Canadians. Eleven thousand of the foreigners were from Austria-Hungary, 3,000 from Germany, 5,500 from Scandinavia and 6,000 from Russia. These Albertans are, for the most part, a select lot of people, vigorous and enterprising. I speak here of the great mass of the people, and do not mean to say there are no undesirables, no misfits.

Coming now to the health problems we find that these are much the same as elsewhere, but are given special character by the local circumstances. In spite of the large immigration into the province from many and widely separated sources, we have little imported communicable disease. We have a good deal of imported tuberculosis, owing to the reputation of the climate for dryness and pure air; but the cheap, home treatment with pure air among friends in the East is proving a better thing than the expensive change of climate among strangers in the West; and in future we will be more concerned with the home-grown tuberculosis which finds good soil, even in Alberta, when people shut out the *fresh air* as well as the cold.

The rapid growth of the urban population makes public sanitary provisions an acute problem, and to meet this need the Government has wisely provided a provincial sanitary engineer to advise and confer with municipal authorities in all sanitary engineering matters. A good public health act has made possible ample provisions in the regulations of the

provincial Board of Health for all detailed legislative public health requirements. A provincial laboratory has been established to aid in the diagnosis of communicable diseases and in the supervision of public water and milk supplies.

I believe we have in Alberta an intelligent population, among whom a campaign of education in health matters of all kinds would be well received. In rural communities personal and household hygiene are of prime importance, and a knowledge of these may be fostered through the schools, the public press and in other ways. In our urban communities the present and future opportunities for good sanitary provisions are very great, because their rapid growth gives a plasticity to all the municipal utilities which is not seen in slow-growing towns. The possibilities contained in this plasticity are further enhanced by the fact that the average of intelligence of the western selected and imported population, including the old timer, is higher than in older home-grown populations.

To my mind the situation in Alberta is extremely hopeful. We have the light of the experience and investigations of the East to guide us. We have an intelligent, law-keeping people, and we have "caught Alberta young." Great, then, is the opportunity, and equally great the responsibility on those whose duty it is to utilize the opportunity.

SOCIOLOGY OF THE MIDDLE AND FAR WEST*

By DR. CHAS. F. FAGAN

Victoria, B.C.

ABSTRACT

Sociology has been defined as "that branch of philosophy which treats of the constitution, phenomena and development of human society." This definition implies a great range of subjects and a very wide field of research.

The Middle West is, of course, in a sociological sense, the older part of this enormous area. It contains the larger cities, is the home of a vast industrial population, supports a large number of people dependent on agriculture, and is probably today the richest part of the North American continent.

The Far West, as we know it, between the broad Pacific and that great serrated barrier called the "Rockies," is a very new country, endowed with wonderful resources, but with as yet a relatively small population. Within the recollection of many living men it was a wilderness. Some residents of the Pacific slope have witnessed the birth of law and order in this great region, as yet, in comparison with its area, only peopled in small spots.

The cause of such rapid development in the Great West — a development such as has taken centuries in older countries — is doubtless due to the phenomenal inrush of population within the past twenty or thirty years. Probably in no part of the world is there assembled a greater variety of races than is to be found in the country under review. Here are brought together, not only people of every continent, but, in appreciable

* Read before the American Public Health Association at Winnipeg, August, 1908.

numbers, of almost every national division of the continents. Every type of humanity, every form of religious belief and many phases of social development are represented. Working side by side in domestic, manufacturing, mining, commercial, agricultural and other occupations, their offspring associated in the same educational institutions, all avowedly entitled to equal rights and equal protection under the law and having innumerable interests in common, this congeries of races will, it appears certain, ultimately be so connected by intermarriage as to gradually evolve a people of a more distinctive type than the "Southerner" or the "Yankee." Whether this new type is likely to be, from a social point of view, as good as the older ones of the North American continent is a matter for question. Whether an admixture of the blood of the Anglo-Saxon, the Celt and the Scandinavian with that of the low-class Slav (*et hoc genus omne*) and possibly with that of the Indian and Asiatic, will produce a population altogether desirable may be doubted.

In regard to the absence or deficiency of moral training in the public schools, the importance of the subject cannot be overrated. It is improbable that the people will ever be unanimously in favor of sectarian or non-sectarian public schools: nor is it, perhaps, necessary that they should be. However this may be, moral science or moral training should be a subject, and take a very prominent place, in the curriculum of the schools. It is possible to instill respect for truth and honor and general good conduct into the minds of youths without encroaching on the tenets of any particular religion or offending any sect worthy of consideration.

The people of Western Canada and the Western United States are an exceptionally bright, quick and capable people; more especially is this true of the agricultural population. Untrammeled by custom and spurred on by necessity, they seem to be willing and able to meet and deal with adverse conditions. In older countries the everyday wants are supplied, the individual seldom thinks for himself and what is

presented is accepted. In this new country, ordinary facilities being absent, the man is thrown back on his own resourcefulness and on his capacity to meet constantly arising and often very sudden contingencies. Necessity, then, has stimulated an independent line of thought, which undoubtedly has developed an exceptional capability. Any observer with open mind will admit this if he has seen the home phases of life, as the writer has in the course of his medical experience in the West.

The home may not have all the luxuries apparent in older countries, yet the solid needs are supplied in abundance; each member of the household has his or her share in the work; the drone in the family beehive is an exception, and family love and family ties are firm. While children leave the parental home at an early age, they are, no doubt, influenced by the prevailing spirit of independence, and are stimulated by the immense possibilities of success open to all who are in good mental and physical vigor. Yet, while this spirit of independence is good, it is to be regretted that youths are allowed to exercise freedom of action at an age when neither discretion nor judgment are developed. The result is that boys of tender years too frequently pass through experiences which men in older countries only know of by report.

A reprehensible characteristic noticeable is the shaping of their own educational courses by juveniles. They attend or leave school at will, and in the selection of a calling play to their young fancies, according to their own whims and very often in direct opposition to their parents' wish. This false idea of independence may right itself in time, but much evil and great suffering in the meantime must result.

The public schools in the West are the product of that independent spirit which dominates all classes. It is recognized that a trained mind is essential to success, and in a country of opportunities, such as ours, it is felt to be but fair and just that every chance should be given to the rising generation in their fight for the better things of life. As a

result of this feeling, a good sound practical education is now open to all, without distinction of class or race.

While on the subject of our schools, a neglect not peculiar to the West should be noticed, — the want of teaching of hygiene. The writer's opinion is that the teachers are unlearned in the science, and that the text-books used are a farce.

The younger generation should be properly and thoroughly instructed in the principles of hygiene, not only that they themselves may reap the benefit, but that as fathers and mothers they may be able to impress their children with a knowledge of the proper condition of living.

At the same time we must condemn the want of adequate teaching as to healthy living, it must be admitted that the intelligence displayed in so many walks of life is not altogether wanting in hygienic matters. Here are some extracts from a Frenchman's review of western life as it appeared to him: "The intellectual and moral aspects of the people are exclusively practical." "Outdoor sports take the first place in the amusements of the people." "From the fine residences which grace the elegant suburbs of the cities to the small wooden houses in the mining camps, we find electric lights, telephones, bathrooms, — an astonishing fact to a European."

A building is said to be a reflection of the wealth and intelligence of the responsible promoter. To a greater extent, then, it may be asserted, are public institutions a reflection of the wealth and intelligence of a people. Such an aphorism is probably true, but, like so many general statements, this one must be qualified. It is to be feared that the words "reflection of wealth and intelligence" are too often misconstrued. Politicians and estate promoters and tourist guides point with pride to our magnificent structures built at the public expense. They delight to explain the architectural beauties and the rich designs, and point to the costly embellished stone façades and marble fittings. No doubt such structures appeal to the æsthete and the artist and are

educationally of advantage. But a question arises here. Might not some of the money expended on these buildings have been devoted to more pressing public needs with greater advantage? We see city halls, public libraries, courthouses, post offices, etc., that cost huge sums of money which, from an architectural and artistic point of view, leave nothing to be desired. Here, then, is where our general statement must be "qualified." Have those who are responsible for these grand buildings made all necessary provision for other more pressing demands? This question might well be submitted for discussion.

However open we may be in this western country to adverse criticism for undue expenditure on unnecessary architectural grandeur, there is one class of building we can point to in honest pride, namely, our hospital accommodation. So far as the writer knows, the West in general is well equipped with hospital buildings. In British Columbia there is no town of any size which has not its hospital, equipped and furnished as completely as any hospital in Montreal or New York. And what is better, there is in attendance a physician and surgeon, not only one who can, but one who does perform with success all the operations known to surgery.

This paper has perhaps trespassed too much on your time, but one more point should be touched on, namely, the difficulties met by the experts in preventive medicine.

In days gone by the greatness of a country was gauged by its wars and their results. When the history of our country is written its greatness will be judged by the results obtained in the development of ideas and agencies which look to the preservation of health and life rather than their destruction.

Contradictory as it may seem of this statement, it may be remarked that the people as a whole, instead of coöperating in matters and movements tending towards the preservation and development of public health, in reality oppose them. This may be explained in a measure by the spirit which dominates in all communities having a representative form

of government, a tendency to criticise and oppose all public measures up to a certain stage. The result in the end is, of course, to obtain the best form of law, although in the process of development injury is being done and lives are being lost. Examples of this are seen in the opposition of a section of the western public to compulsory vaccination, to the use of antitoxine in diphtheria, to the reporting to the medical health officer of infectious or contagious diseases. But in these, as in other matters for the public good, time, patience, firmness and tact, combined with the beneficial results obtained, are the greatest educators. It takes time to educate, and it is for medical reformers to be patient but unceasing in their efforts.

SOCIAL AND PUBLIC HEALTH DEVELOPMENT OF THE NORTHWESTERN STATES AND OF THE WESTERN CENTRAL PROVINCES OF CANADA*

By PETER H. BRYCE, M.A., M.D.

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ABSTRACT

Holding, as we are, our annual meeting for the first time in that region of Canada west of the Great Lakes, it is most natural that our attention should be given to what we may call the natural history of its development, and especially to that of the great prairie region of the North Central States, so similar in its soil, its vegetation, its climate, and in the occupations of its people.

The 1900 United States Census Report states that in 1850 three-fourths of the total value of the farm lands in the United States was east and south of the Ohio Valley.

TABLE I. Showing number of farms and farm values in the North Central States by census records, 1850–1900.

Year	*Number of Farms*	*Percentage Increase*	*Average Value Per Acre*	*Average Value Per Acre for United States*
1850	437,597	....	$14.59	$13.51
1860	772,165	76	23.39	19.60
1870	1,125,078	45	29.57	21.94
1880	1,697,968	50.9	29.51	22.72
1890	1,923,822	13.3	33.20	25.81
1900	2,196,567	14.2	36.25	24.39

We thus see that the increase in the number of farms in 50 years was five fold, or 100 per cent, averaged for the

* Read before the American Public Health Association at Winnipeg, August, 1908.

five census periods, the great increases being, of course, when the unsettled lands were plenty.

The total farm values for the United States in 1900 were $20,514,001,838. That it was population alone which made these increases primarily possible is apparent.

TABLE II. Showing the increase through immigration during the twenty years, 1880–1900, into the North Central States.

	Increase in Foreign Born	
State	1880 *to* 1890	1890 *to* 1900
All United States	2,628,161	1,151,981
Total North Atlantic	1,073,657	874,619
Total North Central	1,143,285	298,360
Illinois	258,771	124,400
Michigan	155,372	2,227
Wisconsin	113,774	3,228
Minnesota	199,680	37,962
Nebraska	105,128	25,195
N. Dakota (Inc.)	346.7%	(Inc.) 38.8%
S. Dakota (Inc.)	171.0%	(Inc.) 2 %

The marvelous development of these North Central States is seen from the tables. Thus, while between 1880–1890 all the United States has an immigration of 2,678,161, that portion going to the twelve North Central States was 1,143,285, as compared with 1,073,657 to the North Atlantic States. The percentage increase between 1870 and 1880 of immigration to these States had been even greater, not only because of the general commercial depression, but also because the best lands elsewhere were taken up. There was a remarkable falling off of immigration to these States between 1890–1900, the total being 298,360; while Wisconsin, which had received 113,774 in 1880–1890, got but 3,228 during this ten-year period. During the 1890–1900 decade a quite different class of immigration to the United States prevailed, the industrial States, the North Atlantic, getting 874,619. Not alone is the number of immigrants of interest and importance, but its character is of even greater influence on the development of a new territory.

By comparing the percentage of males of voting age in

the North Central States, we find that the total colored population in 1900 was but 2.3 per cent of the whole, the highest being 5.5 per cent in Missouri. We further find, as we would expect, that the older the settlement of any State the larger the percentage of native whites, no matter what their original nationality had been. Thus Indiana, whose settlement commenced with the beginning of the last century by migration from Virginia and Kentucky, had 71.9 per cent of native whites, while Wisconsin had but 20 per cent of native white parentage, 33.8 per cent of foreign born parentage, and actually 45.1 per cent of foreign born, only being exceeded in the percentage of the latter by North Dakota with 58.3 per cent. of foreign born. Kansas and Missouri are next highest in percentage of native-born white, having 64.9 per cent and 64.4 per cent respectively.

In all, in the 26,000,000 of population in the North Central States, the native-born whites in 1900 were 48.5 per cent, those of foreign-born parentage 21.7 per cent, and actual immigrants 27.5 per cent.

The nationality of the foreign-born or immigrants in 1900 in these North Central States is of especial interest.

Table III. Giving nationality of foreign-born or immigrants in North Central States in 1900.

Austria	70,350		Mexico		1,434
Bohemia	118,883	222,163	Norway		285,572
Hungary,	32,930		German Poland,	108,469	172,076
English Canadian		345,304	Russian "		36,893
French Canadian		77,019	Austrian Poland,	26,714	
Denmark		99,845	Sweden		368,869
England		260,369	Switzerland		55,850
France		30,645	Wales		31,737
Germany		1,461,603	Russia		107,529
Holland		77,775	Scotland		72,123
Ireland		34,805	Miscellaneous		82,971
Italy		55,085			

Thus of the total 4,158,474 foreign born, Germany supplied 1,461,603; Sweden, 368.869; English Canadian, 345,304; and French Canadian, 77,019; Norway, 285,572; England, 260,369; Austria, 222,163; Poland, 172,076; and Russia,

107,529; Denmark, Holland, Scotland, etc., supplied less than 100,000 each.

It will be seen that apart from some 300,000 Slavs, this enormous mass of immigrants is made up wholly of Teutonic races, varying, it is true, in language and, to some extent, in customs; but alike in being largely agriculturists, coming from countries where primary education is general, and having a common ethical basis as regards education, religion and progress. Viewed from the standpoint of citizenship, it is found that of the 2,079,811 foreign born of voting age, only one-tenth was not naturalized in 1900, mostly because of their too recent arrival, and but 8.5 per cent were unable to speak English. Of the total illiterates in all the children of the foreign born in the United States but 2 per cent were illiterate as compared with 5.8 per cent of native-born white parents.

But enough has been said to fully illustrate the outcome of the vital energies of such a population as has peopled within fifty years what was an illimitable tract of prairie, inhabited almost wholly by the red man and his source of maintenance, the buffalo. So rapid has been the process, so prosaic the methods, so wanting in the elements which make up the historic hero of chivalry or of the modern novel, that in large degree we fail to grasp the meaning of it all as affecting the work with which this Association has, for the most part, concerned itself. Yet that many millions of men from every country of Europe, from the Eastern States and from Canada could, with no concerted action, no superior guiding hand, no hard-and-fast laws, indeed nothing but individual energy, become a largely homogeneous community, governed by laws marking the most advanced communities as regards social life, moral standards and sanitary regulations, is to me one of the most remarkable of sociological phenomena.

We have at least one means more added to those already utilized of estimating what this means from the public health standpoint in the death rate as given in the census.

The following table is given of deaths in the twelve States, according to the 1900 census:

Table IV. Giving deaths in North Central States as per census of 1900.

State	*Population*	*Total Deaths*	*Rate per* 1,000
Ohio	4,157,545	53,362	12.7
Indiana	2,516,462	33,586	13.1
Illinois	4,821,150	61,229	12.7
Michigan	2,420,982	33,572	13.8
Missouri	3,106,605	38,080	13.2
Minnesota	1,751,394	17,105	9.0
Kansas	1,470,495	16,261	10.9
Nebraska	1,066,300	8,264	7.7
N. Dakota	319,146	2,287	7.0
S. Dakota	401,570	3,088	7.6
Wisconsin	2,069,042	24,928	12.1
Average, 10.7 per 1,000.			
United States	75,994,575	1,039,094	13.7

To complete a table for comparison a similar list of deaths from consumption, diphtheria and typhoid, the three types of preventable diseases, may be given:

Table V. Showing deaths in North Central States in 1900 from consumption, diphtheria and typhoid.

State	*Consumption*	*Diphtheria*	*Typhoid*
Ohio	5,789	698	1,795
Indiana	4,232	523	1,496
Illinois	6,786	1,504	1,897
Iowa	1,805	255	549
Michigan	2,438	378	680
Missouri	4,107	494	1,790
Minnesota	1,844	357	386
Kansas	1,414	243	688
Nebraska	592	162	260
N. Dakota	246	120	65
S. Dakota	425	89	73
Wisconsin	2,350	352	365

The tables show that while the deaths per 1,000 for all the United States were 13.7, those for the North Central States were 10.7, to which, perhaps, ought to be added a correction of some 20 per cent. The figures of previous censuses give even lower death rates, so that we may not take these returns as more than indicating a relatively low mortality for all the States of this great area.

When we turn to the census of 1905 we regret to find that

only four of the twelve States are registration States, so that apart from several large cities no mortality comparisons are made. Taking the figures, however, for what they are, it appears that there were 32,022 deaths from consumption, or 1.2 per 1,000; 5,375, or .20 per 1,000, from diphtheria; and 9,044, or .34 per 1,000, from typhoid. Selecting registration cities within these States, given in the 1905 census, it is found the deaths from consumption in increasing order of prevalence were, St. Paul, 1.13; Omaha, 1.13; Detroit, 1.13; Milwaukee, 1.15; Chicago, 1.56; Indianapolis, 1.92; St. Louis, 1.95; Kansas City, 2; Louisville, 2.08, and Cincinnati, 2.30.

Assuming a similar correctness of returns we see very notable differences in the mortality from consumption, the older cities with denser populations, more slums, somewhat greater colored populations having notably higher rates; but it is also true that these States are the more southerly ones with long, hot summers, changeable winter climates and, judged by the higher death rates in diphtheria and typhoid, of a generally lower standard of municipal sanitation. Making every allowance for these several factors it is, nevertheless, distinctly evident that those States with the largest percentage of foreign population of Teutonic immigrants are those which have most notably advanced in population, agriculture and manufacturing industries, as well as in application of public health principles in State and municipal affairs.

The comparison of the average deaths from typhoid in the five years, 1900–05, in registration cities tells the invariable story of a polluted water supply being the measure of typhoid deaths. The order of the cities is, Detroit, .21; Chicago, .29; Minneapolis and Milwaukee, .44; Indianapolis and Kansas City, .48; and Cincinnati, .55 per 1,000.

Very much more of a comparative nature might be added of public health work done, as well as requiring to be done. When, however, we find such a stupendous work as the Chicago Canal carried out to remove the opprobrium of an enormous

and ever-increasing death rate, and the State water surveys being made, it is evident that the States of the North Central Division are continuing to illustrate the quality of their population, in public health work as in matters more immediately commercial. There is no time, and I am not in a position to measure relatively in educational and other social matters this progress; but of what we know of two or three of these States, it will, perhaps, be found that they are leading in these matters almost as much as in the matter I have referred to.

It may be incidentally of some interest to members of the Association outside of Canada to know that since 1891 up to 1906 some 11,678,357 acres have been occupied in the northwest provinces by persons who were foreign-born immigrants, and that they had, in 1906, some 2,307,879 acres in crops. There were in the three provinces, according to the 1906 census, 50,304 families representing 205,774 persons. It may further be of interest to these members, as to us Canadians it is a matter of satisfaction, to learn that of this total 70,703 were farmers from the United States, and were particularly from these North Central States, where we saw so large a number of English Canadians settled between 1880 and 1900, and that these settlers had in crop 964,438 acres of the total 2,307,279 crops belonging to immigrants in 1906. This latter represents some 27 per cent of the total 8,407,697 acres in crop in 1906 in the three provinces of Manitoba, Saskatchewan and Alberta. The rate of development in these provinces may further, perhaps, be understood when it is pointed out that in five years, from June 1, 1901, to June 1, 1906, they received 233,457 foreign immigrants as compared with 298,360 immigrants added during the ten years, 1890–1900, to the population of the twelve North Central States. This was out of a total of 962,587 immigrants to Canada from 1900 to July, 1907. As regards public health development west of the Great Lakes, I shall leave its details to be set forth by officers of the three public health depart-

ments of these prairie provinces. Of their municipal and social advancement I need not do more than ask you to examine for yourselves Winnipeg, the oldest of these cities. But if you wish to go further, then I would say visit Regina, equipped in all which goes to make up a modern city, and which supplies most interesting illustrations of advanced municipal work; while under the shadow of the Canadian Rockies stands Calgary, the oldest of the cities of the "Foothill" province, sunny Alberta, and illustrating what twenty-five years can do to develop the social graces in this health resort climate, famed for its healing effects on consumptives. With legislative machinery and administrative government established in these provinces years before the rush of immigration, it may fairly be asserted that, with a commercial expansion duplicating that of the North Central States, these provinces will prove, at least, the peers in social progress of those sister States whose history I have attempted to summarize.

THE RAT AS A FACTOR IN DISEASE*

By DR. N. K. FOSTER
State Board of Health, California

ABSTRACT

That the rat can and does transmit disease is no idle charge. Living and feasting as they do on the waste of humanity where the disease germs must, of necessity, be found, and ranging through our dwellings and storehouses with this filth upon their feet, no other result could be expected. It is believed that they spread trichinosis, and lately there has been found San Francisco several rats affected with a leprosy-like disease.

Whatever one may believe regarding his rôle as carrier of the ordinary infectious diseases, his accountability in this is but a drop in the bucket when compared with the untold misery and uncounted deaths which are the result of a disease peculiarly his own, — the plague. We may forgive him the disease he accidentally spreads, and the millions of dollars worth of property he yearly destroys, but certainly not his inflicting upon us his own troubles at such a frightful cost. Since he introduced the plague into India in 1896, there have died upwards of six million people, "and the mortality for the week ending April 20, 1907, was as high as 76,000 deaths, practically equal to the British army in India wiped out in a week." This is the cost in lives in one country alone. Others have suffered severely, but no other to this extent.

The money cost is hard to estimate, but in Japan, where a strong and earnest fight is being made to wipe out the disease,

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it has been estimated that each death from plague has cost $7,500. In California, where, during the past year, there have been about 170 cases, with a 55 per cent death rate, the cost has been approximately $1,000.000.

There are two propositions that may well be stated here: first, that with plague all over the world and on the advance, eastern North America has grave cause to fear its appearance; second, that plague is a rat disease, and "no rats, no plague." This is so fully proven and universally believed that no time will be taken to discuss it. The conclusion seems clear. *Destroy the rat.* And why not? It will be conceded that he is useless, and that he destroys yearly millions of dollars worth of goods and produce. He has no redeeming qualities and serves no useful purpose, but is wholly mischievous and offensive, nor is it impossible to practically exterminate him. Innumerable individuals have done so from their own premises, and if this effort was extended to all and made country wide he would have to go.

Meantime there is need of active work on the part of the health authorities. Upon us rests a duty which, if properly performed, will save many lives and much expense. The people must be taught the danger from rats, and be prepared for the rodent disease, — plague. The danger of infection from this disease is not so much from the Pacific coast as from South America, where there is extensive infection, and from which rats can, with comparative ease, gain entrance to your cities. While rats are great travelers by water, they do not particularly like to travel on railroad trains, as they find difficulty in getting a supply of water to drink. They are, however, carried in goods that furnish a hiding place, such as furniture covered with burlap, or bananas in sacks. It is not enough to depend upon the very efficient work done by the Public Health and Marine Hospital Service. We must work ourselves and put our cities and towns in such condition that no fear may be entertained of the disease.

There is little to fear from a case of human plague, its presence would be of no great moment, but not so a plague-infected rat. He would soon spread the disease among others of his kind, and a disease will be implanted that will cost much energy, wealth and peace of mind to eradicate. What shall we do?

Every building in a city should be made rat-proof. This seems a big undertaking, and it is, but it is not impossible nor so very expensive for new buildings. The basement should be made of concrete, and the walls closed so the rats cannot get into them. Stables especially should be concreted, and no manure allowed to accumulate unless in tightly covered rat-proof bins. Hay lofts should be made as proof as possible against them, and the hay piled so that cats can circulate among the bales.

All rubbish should be destroyed and not allowed to accumulate, for it is a breeding place for rats. All garbage should be kept in closed metallic cans, and nothing thrown out that a rat can eat. Chicken yards, where rats get such a large share of their food, should be made rat-proof by a sheet iron or wire net fence set fifteen inches into the ground. Cats which are good ratters should be especially bred and given an opportunity to show their value. They are their natural enemy, and if given a chance will destroy them, but it must be remembered that the rat can go where cats cannot and thus escape them. Such places must be destroyed, thus giving the cat a chance.

The destruction of rats by means of spreading among them some infectious disease has not proven a success in California. It has been extensively tried, and while in some instances may have been effective in lessening their number, it has not done what we sincerely hoped it would do. There is still a possibility that in time something may be found at once harmless to other animals as well as man, but destructive to rats. It is certainly something for which to hope.

To be successful in a rat campaign it is necessary to deprive

them of food and breeding place, and our principal efforts must be in that direction. Poison and traps are good as auxiliaries, and should be used, but by cutting off their food and destroying their home much more will be accomplished, and, fortunately, all these things are directly in the line of good sanitation, and will improve the general health of a community.

To accomplish these things requires the united effort of health and general authorities of a city. It is nearly useless for a health department to issue warnings. Stringent laws should be passed and rigidly enforced, and a healthy public sentiment aroused which will not tolerate the existence of vermin around a party's house any more than it does on his person. Every one should be made to feel the disgrace of harboring rats as well as its danger, for pride has a greater hold than fear, and many who would scout the idea of danger would bow to a popular feeling of evasion against a rat-infected house.

YELLOW FEVER IN MEXICO*

By DR. EDUARDO LICEAGA
Federal Board of Health, Mexico City, Mexico

ABSTRACT

Following the custom of previous years, I now come to report to the American Public Health Association on the yellow fever which has been observed in the Mexican Republic from the 5th of October, 1907, up to the day on which I read this report.

As stated in my last report, during the year of 1907 there were not more than five cases observed of this disease, the last one, on the 5th of September, 1907; and consequently, during the last three months of the year, not a single case was observed throughout the Mexican Republic until the 18th of May of this year, when the first case was reported in a small focus which appeared in the port of Laguna del Carmen, on the Gulf of Mexico, belonging to the State of Campeche. We thus find that over nine months elapsed without a single case of yellow fever being observed in our country.

As soon as the Supreme Board of Health heard of the first patient, it sent to the port of Laguna del Carmen one of its most experienced physicians in the struggle against yellow fever, accompanied by a sufficient number of agents to form a brigade, which, like all those operating in the country, occupied itself with the preparation of a list of the immunes and non-immunes in the port, with daily visits to the former in order to isolate any who might show symptoms of fever, whatever might be the cause. These sick persons were kept

* Read before the American Public Health Association at Winnipeg, August, 1908.

isolated until it was clearly ascertained that the disease from which they suffered was not yellow fever. The brigade also made a careful fumigation of the ships anchored in the bay, of the houses which had been occupied by the patients or suspected persons as well as those of all who had come in contact with the sick, in fact, almost throughout the entire block. At the same time other agents attended to the destruction of the larvæ of the mosquitoes in the water tanks or other deposits found in the interior of the dwellings; to the renewal of the water and the closing of the tanks, so that the female mosquitoes would be unable to lay their eggs in them. Steps were taken to clean up the town and to spread oil on all water reservoirs which could not be covered.

This campaign was carried on, not only by the brigade which was sent to Laguna del Carmen by the Supreme Board of Health, but also by the local authorities and even the entire population, whilst the state government gave very efficient aid by orders which rendered the struggle against the disease more rigorous and efficacious.

The result of the campaign has been the extinction of this focus.

An American lady embarked on the river and probably carried the disease with her in a state of incubation to Frontera, which is also a gulf port, in the State of Tabasco, and there the disease broke out. She was promptly and carefully isolated; the same precautions above indicated were adopted and the focus was extinguished in its origin, as from the 4th of July of this year no other case has been observed in Frontera.

Through the carelessness of an employee of the yellow-fever service a case of that disease which appeared in Vera Cruz and had a fatal termination was not reported until the 7th of July, and consequently that case was not isolated in due time. Up to the present date we have been unable to discover the origin of that case. On the 14th another suspected case was reported in the person of a non-immune, and

notice thereof was given, both to the authorities of the country as well as to the sanitary authorities abroad; but once the blood was analyzed it was found to be a case of malaria, and the patient recovered under the corresponding treatment. Notice was then sent to the sanitary authorities of the United States and Cuba that this case should not be reputed as one of yellow fever.

Six other cases then appeared on the 16th and 30th of July, and on the 4th, 7th and 15th inst., with five deaths, making a total of seven cases and five deaths.

The whole of these made their appearance in only one of the four districts into which the city of Vera Cruz is divided for the purposes of the yellow-fever service.

I have thus shown that, up to the date of this paper, thirteen cases and six deaths were reported in Laguna del Carmen, and the focus was suppressed; that in Frontera we had a single case, which was imported from Laguna; and in Vera Cruz, seven cases and five deaths, the last being on the 15th of the present month.

THE RELATION OF STATE OR PROVINCIAL BOARDS TO MUNICIPAL BOARDS AND LOCAL HEALTH OFFICERS*

By CHARLES A. HODGETTS, M.D., L.R.C.P., LONDON
Chief Health Officer of Ontario

ABSTRACT

The relationship of the central state or provincial health authority to subordinate health authorities is one deserving of serious consideration if material progress is to be made, and if concentration of all that relates to public health is to be found in the central authority. Without entering into a lengthy review of their existing status as set forth in the various state and provincial laws, the subject may be dealt with under the following headings: (*a*) Mandatory Powers; (*b*) Advisory Duties.

MANDATORY POWERS. The central health authority should, for the health of the general community, in certain matters possess mandatory powers, and the carrying out of the orders should primarily rest with the local authorities. Upon failure on their part so to do, the power should then rest with the central authority, all costs and charges incident thereto being paid by the parties or municipality affected. Particularly should this be the case in nuisances, the suppression of communicable diseases, and where in all cases upon investigation it is found the local boards have, through indifference or other cause, failed to act.

Such important health matters as public water supplies,

* Read before the American Public Health Association at Winnipeg, August, 1908.

sewerage systems and sewage disposal plants should be under the direct supervision of the central health authority, which should be properly equipped with a staff of sanitary officers as are necessary in such cases. The work should not be divided and given over to independent commissions or boards.

It should also be made impossible for municipalities to initiate, construct or extend either of the above systems or works without the approval of the central health authority, and the issue of debentures and the floating of bonds should be dependent upon this authority's sanction of the scheme and supervision of its construction. Far too often have municipalities been put to undue and unnecessary expenditures in the installation of such schemes, and upon which subsequently they have been called upon to spend still further sums in order to protect, not only the lives of their own citizens, but those of more remote municipalities.

In the larger question of sewerage systems, sewage disposal plants, water work systems and protection and purification of public water supplies it is essential in the interests of the state or province that the initial sanction and subsequent supervision of the same should rest with the central authority. These are health matters affecting so many that they should be placed beyond local authority control, although the responsibility of carrying out of the details of supervision, etc., may properly be placed upon the local health authorities; indeed, where immediate action is necessary, it could hardly be otherwise.

Then, where the local authority, board or official fails to carry out the wishes of the central authority, power should be vested in the latter to do the work or perform the service at the expense of those liable therefor.

ADVISORY DUTIES. As at present constituted, the central Board acts very largely in an advisory capacity to municipalities and local authorities, often directing health

work as applied to the whole province, at least in Ontario, by what are known as Orders-in-Council, which have legal weight for certain definite periods, and frequently advice is given to boards where these minor bodies fail to decide as to a definite line of action. With a reorganized central authority, a large amount of this class of health work would necessarily fall upon the executive health officer and his staff, the advantage being that there would be no delay in consideration of questions as they arose, they being dealt with almost immediately, — an advantage of great importance. With the despatch of such work more time would be given the Board for the consideration of matters requiring some consultation with the chief officer and members of the staff.

In the manner thus briefly outlined has been set forth the relationship which the central authority should bear to all local boards and officers.

STUDY OF DIPHTHERIA OBSERVED IN GUADALAJARA, MEXICO, FROM THE 1st OF JANUARY, 1904, UNTIL JUNE 30, 1908, FROM A HYGIENIC STANDPOINT*

By DR. M. MENDOZA LOPEZ
Mexico City, Mexico

ABSTRACT

In Guadalajara, a city of 102,000 inhabitants, an area of 11 square kilometers, and having an elevation of 1,566 meters above the level of the sea, were registered, according to data found in the archives of the Supreme Board of Health, 641 cases of diphtheria from the 1st of January, 1904, until June 30 of the present year.

This figure is superior to that ordinarily observed, for during this lapse of time an unusually dangerous and general epidemic developed, commencing in June, 1904, increasing rapidly in February, March and April of 1905, and subsiding during August.

Of the 641 cases already cited, 360 belong to this period of fifteen months, and 281 are distributed among the remaining thirty-nine months; which give to these latter months an average of 7 cases a month, a figure which I consider highly abnormal.

While the epidemic lasted, 136 expired; which produces a death rate of 37.77 per cent. The total deaths for the other months were 281; the death rate 46.26 per cent.

The course of the Board of Health with regard to diphtheria has always been the same which it observes when any of the infectious diseases break out.

* Read before the American Public Health Association at Winnipeg, August, 1908.

All physicians, owners or those in charge of inns, hotels, tenements, etc., are compelled by our Sanitary Code to notify the Board of the cases of diphtheria which they observe. If the notification proves to be true, and the patient inhabits a tenement house, hotel, etc., he is immediately sent to the pest-house and the place he has occupied is immediately disinfected; if he occupies a private house and it is possible to isolate the patient he is allowed to remain and the family are supplied with printed directions necessary for the case. When the disease has passed, the process of disinfection is begun. If several cases appear and for this reason it is thought probable that the epidemic form of the disease may develop, the Board is notified or the mayor informed, who in turn orders the agents of the police force to visit daily the tenements, inns or hostelries, etc., and notify at the police stations if they find any person suspected of having the disease, so that he may be examined by an expert.

With regard to the sick who are allowed to be nursed at home, the physician in charge dictates, according to the instructions of the Board, all measures conducive to isolation. Notwithstanding the assiduous care of the Board, and of all the physicians, the distribution of instructive pamphlets, etc., the isolation obtained is defective.

I remember one day being called to visit professionally a certain house; on entering the room where the patient lay, he being a child of three years, I found him in the arms of the mother, and ten or twelve children of different ages lounging and gossiping around the child, frightened by the convulsions it suffered. The child who thus attracted the attention of the others had croup and died a few hours after.

This contact, between the sick and healthy, the uninterrupted relations between the persons caring for the sick and other occupants of the house or inn, should produce contagion and the easy propagation of an epidemic; nevertheless this does not generally follow.

In the tenements there were several persons sick at the

same time; but in the private houses not a single case of contagion was discovered, notwithstanding that in many the healthy children remained in the same houses, and for that reason in contact, at least, with the persons nursing the patient. Of the children who surrounded the little patient, of whom I have just spoken, only one was infected, even though the contact was prolonged for three days and very intimately.

With this I do not wish to state that I do not believe diphtheria to be contagious; unfortunately the proofs of its contagiousness are abundant, and great scientists have succumbed to contagion. This has been perfectly demonstrated; but I affirm that the contagion of diphtheria not only is very inferior to that of measles and smallpox, but also to that of scarlet fever.

TUBERCULOSIS AND POVERTY*

By EUGENE T. LIES

General Secretary Associated Charities of Minneapolis, Minn.

ABSTRACT

The task of the charity worker today is a difficult one. He must analyze, he must synthesize, he must get the story in every case of need. He must consider the man in his relation to himself, to his family, to his neighbors and his neighborhood, to his church, to the industrial situation surrounding him, to the general life of the community. This method it is that is leading to the establishment of certain convictions as to what really the problem of poverty in our modern times is; and no other method could have established these convictions.

Would we do anything to throttle poverty, we must try to throttle tuberculosis. Every case forms a possible center of infection for all who come near, and therefore is a potential creator of additional misery and poverty in the world, the degree of danger depending, of course, upon the degree of skill with which the patient is handled. In every instance is there a long-drawn-out period of illness, together with the inevitable gradual decline in earning ability, and the expenditure of great sums of money for medical service and medicines, and in the case of the workingman, the early exhaustion of his own savings and a drawing upon the savings of his relatives and friends.

With the decrease in the workingman's income comes the deprivation of the necessities of life for the other members

*Read before the American Public Health Association at Winnipeg, August, 1908.

of his family, and with that comes their own lessened power of resistance to the germs emitted by the afflicted one. There usually follows, also, removal from good living quarters to less desirable, and finally to insanitary, dark and small rooms, and these probably in a tenement inhabited by many other families.

If it is the father of the family who dies, the wife possibly has to take employment in order to care for the children; or some of the children who, if the father were living, would have deferred the beginning of their working careers to get more education, must go out as wage earners. In either case the normal family life is disrupted, and possibilities for ill consequences are brought into being. Oftentimes the family is forced permanently upon charity when the children are all too young to work and the mother is needed for their care. Unless the afflicted men are union members, outside charitable aid is, in seventy-five per cent of the cases, needed even during their illness.

If it is the mother who dies the children, of course, lose from their lives the influences which, in most instances, would have aided them to self-supporting, useful careers, and without which the possibilities to the contrary are only too rich, as juvenile court and reform institution records show. If the mother is a widow the situation is so much worse, and the children possibly become public dependants.

Moreover, in the homes of the poor, these children are in constant danger of infection. Indeed, there are many instances on record of the extermination of whole families, and in such, life for years becomes a long, wearisome, dragged-out process of money loss, sorrow and terrible woe.

Probably the worst fact of all in this connection is that the strong hopes of the consumptive for recovery all during the long period of his affliction make him a ready victim of the quack and the patent-medicine man, who take his money ruthlessly and guarantee to cure. All the while the disease is getting a tighter and tighter grip upon him. When his

exchequer is empty the quack casts him off and the charities get him, to bury presently. Oh, that we might discuss here the dark and devious ways of these vipers, the advertising quacks, who prey upon the poor and the unthinking! but this is not the time. Suffice it to say that we know of one instance where one of these scoundrels offered to give a man in an advanced stage of consumption a written guarantee to cure upon payment of $50. The offer was not accepted, and nine hours later the man died in the city hospital. No, we are not living in the dark ages!

Of 67 female tuberculosis cases handled by the nurses of the Minneapolis Associated Charities in 1907, 56, or 83.5 per cent, were housewives, mothers of 160 children. Some of these children have since January 1 become half orphans or orphans, and because nearly all of the cases that come to the nurses are of the advanced, incurable type, Minneapolis will, in the end, have 160 motherless children as a result of these 67 cases.

We have considered, meagerly enough it is true, tuberculosis as a cause of poverty. Let us now consider poverty as a cause of tuberculosis. All authorities agree that this disease is preëminently the affliction of the poor rather than of the rich. And the reasons are not far to seek.

The poor live poorly. They do not have proper nor sufficient food. They live in small, often dark and insanitary rooms, and in tenement buildings that may be crowded. Their income is too small to do better. As a rule ignorance and carelessness go with poverty, and therefore we find that the food that is used is improperly cooked, that dirt abounds, that fresh air is tabooed, that children are woefully neglected and badly fed. The mother in the poor family is usually overworked and breaks down in general health. She has too many children, and that fact in itself intensifies the existing want. All these conditions are direct aids in making candidates for tuberculosis. Add together poverty, ignorance and tuberculosis and you have a bad mess which any com-

munity, out of consideration for its own safety, dare not ignore for long.

Consider that the average workingman has not the say as to conditions in the shop in which he works; that he must accept insanitary conditions, dust, darkness, improper toilet facilities, etc., and you see that he may run right into hotbeds of tuberculosis. If there is a union in his trade, probably it will bring about better conditions; but not all unions even are alive to the needs of their shops along this very line. They require instruction as do the employers.

As to the relation between amount of earnings and tuberculosis, studies have been made in various countries; for example, in Hamburg, Germany, it has been found to be generally true for a number of years that the number of deaths from tuberculosis varies inversely as the income.

Moreover, statistics the world over show that this enemy strikes down its victims in fiendish style just at the period when they should be most useful to their families and to society, and when they should be enjoying the fullest vigor of manhood and womanhood. This period is from 20 to 45 years.

What we need in this country is an adaptation of the German system of industrial insurance which would have the effect, as it has in Germany, of encouraging a man to undertake treatment for tuberculosis early, when he is still in a curable stage, instead of waiting, because of the expense involved, until he goes over the incurable line.

Proper living conditions and proper working conditions aid in the elimination and prevention of poverty. Proper living conditions and proper working conditions aid in the elimination and prevention of tuberculosis. Both poverty and tuberculosis are dependent for development, pretty largely, upon similar causative factors, and each may be either the cause or the effect of the other. *We must fight both at the same time.* While at all times it is absolutely necessary, both in the treatment and prevention of poverty

and of tuberculosis, to lay great stress upon personal factors, hygienic, moral, educational and disciplinary, and this on the double ground of humanity and general welfare, yet authorities the world over agree that both are, to a considerable extent, social diseases, and both call for social remedies.

"Everything that can be done to make men healthier and happier is germane to this purpose of preventing tuberculosis. The improvement of the housing of the working classes and of the sanitary conditions of theaters and churches, as well as of factories and shops; the multiplication of parks and playgrounds, gymnasiums and baths; the widening of streets; the enforcement of a standard of healthful conditions in all occupations; the reduction of the working day; the raising of wages; the education of the women and girls of the tenements in the art of housekeeping and the science of food preparation; the crusade against the noxious features of the saloon; scientific instruction about the effects of alcohol in the public schools, — all these and kindred efforts tend less indirectly than might be thought to reduce the death rate from tuberculosis." (From New York Handbook on Tuberculosis.)

Society today, unlike the people of old, simply dares not, look upon this frightful slaughter from tuberculosis as the will of God. It would be utter blasphemy. We cannot fold our hands in dumb resignation. We cannot escape individual and collective responsibility; but the fight is on, the battle is waging the world over. The question is, are WE in the ranks?

SOME REMARKS UPON THE RESULT OF THE PREVENTIVE TREATMENT OF RABIES AND ITS PRESENT STATE*

By DR. DEMETRIO LOPEZ

Mexico City, Mexico

Translation from Spanish

ABSTRACT

I have the pleasure of presenting to you, at the beginning of this treatise, the percentage of mortality among those who, having been bitten by animals attacked by rabies, have been treated in the Instituto Antirrábico of the City of Mexico.

Twenty years ago this institution was opened (April, 1888), and from that time up to the 30th of last June, 8,680 persons have been submitted to the Pasteur treatment, in only eleven of whom it was not successful; that is to say, the absolute percentage of mortality is 0.13 per cent, a number which, compared with that of the anti-rabic institutions of other countries is one of the smallest.

This percentage has been taken for the whole time that this institute has existed. If we consider only the last six years, from 1902 to 1908, together with the first six months of the present year, the results are more favorable. This period is chosen because during this time almost the same number of persons have been treated as in the fourteen previous years; and because it coincides in a singular manner with the de-

* Read before the American Public Health Association at Winnipeg, August, 1908.

crease of the failures in the series of treatments with the dried spinal cord.

During this time 4,579 persons received the treatment, and of these only one who suffered from hydrophobia died. So the mortality is reduced to 0.02 per cent.

It is certain that not all the animals suspected of hydrophobia have had it; and there are many cases in which we could not prove the existence of this disease because the dog has been done away with or the persons interested have not hastened to the laboratory, being careless about the animal which caused the wound. Individuals from all the Federal States come to the institution, even countrymen from the most distant places. It was very difficult to make a moderately scientific examination in these cases. It is certain that our countryman is a good judge of whether or not a dog has hydrophobia; but omitting all these cases in which the clinical and experimental investigations fail, and referring simply to the cases proved, the result for 226 cases which compose this group is a mortality of only 0.4 per cent.

THE BEST METHOD OF VACCINATING WITH HUMANIZED LYMPH*

By DR. FRANCISCO DE P. BERNALDEZ

Mexico City, Mexico

ABSTRACT

It is a well-proved and unquestioned fact that the immunity which is acquired against any infection by means of inoculation is increased in intensity in proportion to the amount of vaccine virus introduced into the system, and in proportion to the degree of its virulence, as long as that system can support it without serious injury; so that whatever may be the method adopted in the practice of vaccination, it should be based on those principles which have been established by bacteriological observation and experiment.

The methods adopted by the vaccination department of the Supreme Board of Health of Mexico with the most satisfactory results are as follows: The region in which the vaccine is to be inserted, whether on the arm or on the leg, is carefully washed with sterilized water, soap and a brush, rubbing with the latter until the skin becomes red, and is then dried with sterilized cotton. The inoculation is then practised with lances that have previously been dipped in boiling water or passed through the flame of an alcohol lamp. The pustules of the child from whom the vaccine is drawn are cleansed exclusively with sterilized water and cotton, are very superficially scarified and not used if they bleed. A small quantity is taken up on the lancet and the

* Read before the American Public Health Association at Winnipeg, August, 1908.

inoculation made in the person who is to be vaccinated by means of small punctures, almost joining each other and six to eight in number. In making these punctures the lancet leaves the lymph spread over the place where the punctures have been made. These should not reach beyond the dermic layer of the skin, because that is where the lymphatic net is found abundant and fine, and, moreover, this is the way to prevent the vaccine pustules from bleeding. The object in making the punctures in the form above described is to produce pustules in a series, so that the collection of the lymph will be facilitated, because there will be only one scar and not several; the pustules may be numerous and, lastly, the vaccination is not painful.

The advantages of this method over others that have been described, that is to say, over the scarifications or scratching of the epidermis, or the cauterization with the small Mayer hammer, are that they do not cause any pain, do not give rise to any flow of blood, facilitate the collection of the lymph, and, above all, that they can easily be examined to find whether they present the characteristics of true vaccination, because this is the only way in which the operating physician can ascertain with certainty whether a person has been well or badly vaccinated. If other methods are employed or the skin is scratched, the pustules cannot present those characteristics, and the operator always remains in doubt as to whether the individual has obtained immunity or not.

DISCUSSION

DR. W. F. ELGIN of Glenolden, Pa. Mr. President: I want to confirm one particular feature of the paper by Dr. Bernaldez in reference to the effect of heat on vaccine matter.

Taking virus from the same animal, and subjecting it to various temperatures and noting the results, we found that a temperature exposure of 60° C. killed the vaccine matter in five minutes; at 37° C. (body temperature) it lasts about

three days. Physicians frequently carry vaccine in their pockets that length of time and wonder why it is not active. At a temperature of about 25° C., or ordinary room temperature, it will last a week or more; at a temperature of 15° C. it will last about three to six months; and if you keep it below freezing point, that is, from minus ten to minus fifteen, it will probably remain active indefinitely. I have kept it for four years, and it was good at the end of that time; so that you see, with a range of temperature of from 65° C. to minus 15° C. you have an active virus ranging from five minutes to four years.

I find many health officers and school authorities resort to vaccination of school children in the fall of the year. The demand for vaccine increases rapidly in August and September, so the number of vaccinations among school children varies from 20,000 or 30,000 in June and July to 300,000 in September. As a result vaccine is prepared, carried about, and used in the hot weather, and thus we get a number of failures because of the effect of the heat on the vaccine.

DR. FELL. The plan we followed during the last two winters in smallpox was this: we took the case out as soon as reported, vaccinated all other members of the household immediately; fumigated the premises, and allowed the vaccinated ones to go on about their usual business, keeping them under observation for two weeks subsequently. If a case was found before the third day of the eruption, we were quite sure there would be no more cases from that one, but if the eruption had been out more than three days, then we were equally sure there would be more cases to follow from the original one; and those so exposed were sent to the isolation hospital.

We do not even follow this plan now, or will not in the future. Hereafter, no matter what stage the eruption may be in, we shall remove the case, fumigate, vaccinate all contacts, and keep them under observation. No suspects will

be isolated or houses quarantined only so long as may be necessary to do our work. This method is going to save our cities and towns very large sums of money in handling outbreaks of smallpox in the future.

DR. WILLIAM A. EVANS of Chicago. There is a growth of anti-vaccination sentiment in this country that, I believe, philosophically, is founded on the prevailing principles of American law. In addition to that, it is founded upon a growing diminution in the virulence of the disease. For several years smallpox has been less virulent than it formerly was, and this decrease in the virulency of the disease is a factor in the development of an anti-vaccination sentiment that, to my mind, bodes ill for this country. There is a lot of anti-vaccination argument that we know is false argument, and I believe that the time has come when some organization should prepare a refutation of that argument; and that this refutation should be given the official indorsement of the organization responsible for its preparation. I know of no organization better prepared to do just that work than this Association.

The basic principle of American law is that every man has control over his own body, and that he alone shall decide what shall be done for that body. There is no part of health department work that does not recognize the exploitation of a law that is higher than the ordinary law, and that is the law of emergencies; but when times of emergency are not at hand, judges, bound as they are by precedent and the legal principles underlying their profession, the law, are exceedingly loath to apply the provisions of emergency measures. We in Chicago feel it unduly by reason of the fact that we are a great dumping-ground for a large number of the surrounding States, in which there prevails a great diversity of opinions and legislative procedures on the question of vaccination, and I verily believe that trouble is at hand

unless something shall be done to refute these pseudo arguments of the anti-vaccinationist.

Therefore, Mr. President, I would move that a committee be appointed from this Association to prepare an argument as to the efficacy of vaccination, and that this Association devise some means for the dissemination of that report; and that some effort be made toward a simultaneous and concerted movement throughout this country in opposition to the anti-vaccination movement. (This resolution was referred to the Executive Committee.)

DR. L. LABERGE of Montreal. We have tried to have a compulsory vaccination act in the city, but have not been able to obtain it; but we have an ordinance which throws responsibility on the employer and the superintendent of schools, and with their aid we are enabled to enforce vaccination; and I must say it has been efficacious.

From the first hour of the outbreak of a case we isolate the patient and quarantine the house for fourteen days; and vaccinate the people the first day. We visit every house the first day, and then in three days afterwards, if we find that the vaccination has not taken, we revaccinate. We keep them in quarantine fourteen days in order to be on the side of safety. Unless this is done we are not sure of preventing the spread of the disease. We have some cases in which vaccination does not take, and it may be necessary to vaccinate them three or four times.

If vaccination were a general measure, there is no doubt that quarantine would disappear and would not be necessary. But I hardly think we will succeed in general vaccination.

Laboratory Section.

THE DETERMINATION OF THE TYPHOID BACILLUS IN INFECTED WATER AND MILK*

By D. D. JACKSON AND T. W. MELIA
Mt. Prospect Laboratory, Brooklyn, N. Y.

ABSTRACT†

It is of the greatest importance in tests of the sanitary quality of water and milk supplies that organisms which specifically cause infectious disease through such sources shall be subject to methods of rapid and definite isolation. Up to the present time this has been a matter of great difficulty and uncertainty, owing to the fact that the disease germs which occur in water, and especially in milk, are intermingled with and greatly outnumbered by other intestinal germs and many species of common so-called air and water bacteria.

The method for the isolation of *B. typhosus*, which the authors desire to propose, is to mix varying amounts of the water or milk to be tested with at least four times the amount of sterilized lactose bile solution, and incubate at least twenty-four hours at 37° C.

In routine work this will be the same as the presumptive test for *B. coli*.

If *B. coli* is present in considerable numbers, then *B.*

* Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

† Complete Paper in Jour Infectious Diseases (forthcoming).

typhosus may be tested for by adding one c.c. of the twenty-four to forty-eight hour culture from the bile fermentation tube to 9 c.c. of sterilized water, and making eight successive dilutions of this, each ten times higher than the previous one, plating one c.c. of each of the entire series into Hesse agar, using porous earthenware tops to the petri dishes, and incubating twenty-four hours at 37° C. in an incubator saturated with moisture.

B. typhosus is characteristic on Hesse agar only when the dilution is sufficiently high to produce but few colonies on the plate. It is distinguished from *B. coli* by the formation of colonies of much larger size, often several centimeters in diameter, and consisting of a broad, transparent or scarcely turbid zone between the white center or nucleus and the perfectly circular narrow white seam or edge.

B. paratyphosus. *B. pyocyaneus*, *B. fluorescens liquefaciens* and some strains of very highly motile *B. coli* sometimes give a similar appearance. All but para-typhoid do not have the transparent zone. The first and last, unlike *B. typhosus*, produce gas in dextrose broth, and all may be readily separated from the typhoid bacillus by applying the Widal test by hanging drop directly from the Hesse agar or macroscopically in small test tubes from a twenty-four-hour bouillon culture. The dilution should run from 1-50 to at least 1-1000.

PREPARATION OF MEDIA

Lactose bile consists of sterilized, undiluted fresh ox gall (or an eleven per cent solution of dry fresh ox gall) containing *one per cent of peptone* and one per cent of lactose.

Hesse agar is prepared as follows:

Dissolve four and one-half grams of *dry* agar in 500 c.c. of distilled water by heating over a free flame, making up loss in weight by evaporation. Into another vessel pour 500 c.c. of distilled water, and to this add 10 grams of peptone, 5 grams of Liebig's meat extract, and 8.5 grams of

common salt. Heat this until all is dissolved, and make up the loss in weight by evaporation by adding distilled water.

Add the two solutions together; boil thirty minutes; make up loss in weight with distilled water and filter through absorbent cotton held in a funnel by cotton flannel, passing the filtrate through several times until perfectly clear. Test the reaction and adjust, if necessary, to 1 per cent normal acid. Use 10 c.c. of medium in each tube and sterilize for twenty minutes at 120° C. in an autoclave. Cool with running tap water and store in an ice chest which is saturated with moisture.

CONCLUSIONS

Bile is a natural medium for the growth of the typhoid bacillus, and it retards the growth of other bacteria except *B. coli*. When lactose is present in the bile, the *B. coli* causes copious gas formation and soon produces sufficient acidity to retard its own growth, so that the final result is a predominance of *B. typhosus*, which has been multiplying rapidly in the meantime and is not materially affected by this acidity.

When samples of water or milk are inoculated into lactose bile, incubated at 37° C., and then transplanted in varying dilutions into Hesse agar, very characteristic colonies are formed in the high dilutions when the typhoid bacillus is present. These colonies are tested by the Widal reaction.

By means of the method described, we have been able to isolate typhoid cultures from feces with certainty at apparently any stage of the disease. We have isolated it from milk artificially infected with small numbers of *B. typhosus*. We have isolated it from the Grass River used as a source of water supply for Canton, N.Y., from a pond and stream used as a local private water supply at Hastings, N.Y., and from two points in the Hudson River. Every known confirmatory test has been applied to the cultures there isolated, including the Pfeiffer and absorption tests, so that their identity is assured.

At Canton and Hastings it was obtained from bile tubes containing ten cubic centimeters of the water; and in the Hudson River, near Hastings, at the time of the local typhoid fever epidemic at that point, it was obtained in bile tubes containing only one cubic centimeter of the water.

Any volume of water may be tested, provided four times as much lactose bile as water is added to the bottle before incubation. In routine water analysis, when gas is formed in the bile tubes, cultures should be plated out on Hesse media to determine the presence of *B. .typhosus*. If characteristic colonies are obtained they should be examined for morphology and motility under the microscope and the Widal test applied. This practically demonstrates their presence, but they should then be isolated in pure culture and plated on the various distinguishing media as confirmative tests.

A METHOD OF DETERMINING THE NUMBER OF DUST PARTICLES IN AIR*

By C.-E. A. WINSLOW

Massachusetts Institute of Technology

ABSTRACT

In many branches of sanitary work, notably in the study of factory conditions, the enumeration of the actual number of dust particles present is quite as important as the determination of the total weight of dust. The following method is a simple one for this purpose. A sample of half a liter or a liter of air is drawn through a two-centimeter layer of granulated sugar (grains .25–1.00 m.m. in diameter), supported in a glass tube of one to two centimeter bore by a perforated stopper, and a square of bolting cloth. The sample should be collected rather rapidly by a suction pump. After sampling, the sugar is dissolved in five or ten c.c. of water and the dust particles in one cubic centimeter of the resulting suspension are counted in a Sedgwick-Rafter cell by the method used in enumerating microscopical organisms in water. (Whipple, G. C., Microscopy of Drinking Water, New York, 1905.)

Glassware and sugar must be clean, and with all precautions the method cannot be relied on for numbers of dust particles below 100 per c.c.; even with this qualification, however, the method is a delicate one. In some tests of

*Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

very dusty air produced by shaking floor dust up in a bottle 13,000–16,000 particles per c.c. corresponds to 3–10 mg. The opportunity for observing the nature of the dust particles is another point in favor of this method, which is suggested as a supplementary procedure rather than as an alternative to the determination of the total weight of dust.

REPORT OF THE COMMITTEE ON TECHNICAL PROGRESS*

ABSTRACT

The report of the Committee on Technical Progress is the report of a committee composed of the chairman of the various technical committees; the chairman of the section being chairman of this committee, *ex-officio*. The object of this report is the correlation and coördination of the various committee reports in order that the whole technical work of the section may be unified.

At last year's meeting but two technical committees existed, the Committee on Standard Methods of Water Analysis and the Committee on Bacterial Milk Analysis.

The Bacterial Milk Committee appointed in 1905 was reorganized in the interim between the 1906 and 1907 meeting and presented its first report to the section last year.

The last report of the Committee on Technical Progress recommended the appointment of Committees on Standard Methods for the various public health services, specifying certain ones.

The Council elected the secretary a committee of one to carry out these recommendations, and his report follows.

A circular letter was sent to every member of the section requesting that he make a first, second and third choice of such committees as he felt the most interest in and on which he could do the best work. From the replies received an eligible list was prepared and submitted to the Council with the idea of selecting from these four members and a chairman for each committee. The first Council ballot resulted in a

* Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908

number of tie votes for both chairman and members, which necessitated the resubmission to the Council of a new ballot.

The second ballot settled all ties, and twelve new section committees were established, as well as the appointment of a member from the Laboratory Section to serve with a member from the Association on a Joint Committee on Mailing Infectious Material.

But three months of the year have been available for the actual work of the committees, and one can readily see that in this limited time little more than organization and a laying out of plans for the coming year could be accomplished.

Practically all section members who indicated their interest in a certain committee have been or will be invited to become advisory members of that committee, and thus all those willing and able to give of their time and strength will find opportunity to turn it to good account. Since, by the terms of their acceptance of committee work, every member is expected to resign if change of position, or other factors, prevent active participation, the prevention of drones on committee seems assured.

We would invite new members and others interested in any of these lines of work to correspond with the secretary, that they be placed either as active or advisory members of these committees.

We would suggest that the committees now in existence be continued with such changes in personnel as the Council may deem wise to make.

It has been said that an organization rapidly decays in the absence of a definite object for its existence. The fact that a large proportion of our membership is now actively engaged in working out problems and standardizing methods for the benefit of this branch of science indicates a live and active organization.

B. R. RICKARDS.
Acting Chairman.

ABSTRACT OF REPORT OF THE COMMITTEE ON STANDARD METHODS FOR THE BACTERIAL DIAGNOSIS OF TYPHOID FEVER*

By F. F. WESBROOK

Chairman

The appointment, somewhat late in the current year, of your committee has precluded the possibility of anything more than a report of progress and the tentative outline of a plan of investigation which seems worthy of trial.

In order to make the laboratory work of the greatest possible value to the executive department of our various boards of health it is wise to plan the best possible articulation of the laboratory work to the discovery of foci of infection and their ecadication. The work of the committee should, therefore, include:

(A) The perfection of standard methods in the determination of the Widal reaction.

(1.) The consideration of the dried blood method, or the use of serum, bearing in mind that many of the laboratories are compelled to operate over a whole State, whereas others limit their work to cities.

(2.) Preparation of outfits for forwarding specimens, the adoption of a standard data blank, and the use of a blank for the clinical history of the case; and, more important yet, the use of a standard blank for epidemiological data. Epidemiological data should be secured at once when the

*Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

specimen is gotten. The clinical blank cannot be prepared in full until the disease has run its course.

(3.) Technical methods in the laboratory relating to the preparation of a standard dilution. The use of gravimetric and volumetric methods.

(4.) The adoption of a standard report blank with necessary interpretation on the part of the physician and health officer of the laboratory report.

(5.) A circular to be issued by laboratories containing a description of the method, copies of all the blanks used, and a brief consideration of the value of the method as applied to the diagnosis of typhoid fever.

(B.) Bacterial investigation.

(1.) Feces. (2.) Urine. (3.) Blood.

As yet no method seems available which is practicable for the use of the State Board of Health laboratory, particularly in relation to blood. Various media, methods and devices should be exhaustively tested by the committee, and a report, first of all, on the practicability of the bacterial diagnosis of typhoid made, and if feasible, detailed standard methods reported. Particular attention should be paid to the collection of data on the so-called "typhoid carriers" in various communities in order to determine their practical importance in typhoid epidemiology.

ABSTRACT OF REPORT OF THE COMMITTEE ON STANDARD METHODS FOR THE DIAGNOSIS OF RABIES*

By ANNA W. WILLIAMS
Chairman

The committee presented a statement of existing points requiring further study and a comprehensive plan for the conduct of these investigations.

For the active diagnostic work until a more definite report can be made the committee recommend the following:

WORKING METHOD FOR USE IN THE DIAGNOSIS OF RABIES

1. Removal of central nervous system and of salivary glands under aseptic conditions.

2. Smears or impression slips made from ammon's horn. These are fixed in neutralized methyl alcohol, and are stained over the flame until steamed, with the following solution:

Methylene blue, sat. alc. sol.	30 c.c.
Fuchsin, " " "	5 c.c.
Distilled water	300 c.c.

(To be kept in ice-box until used.)

If typical negri bodies are demonstrated, the diagnosis of rabies may be made. If they are not found, similar slides should be made from the gray matter, (1) of the cerebellum; (2) of the cerebral cortex (motor areas); (3) of the gray matter from other areas. At leat six slides should be made,

*Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

covering a wide area of gray matter, in order to exclude the possibility of localization of definite negri bodies.

If no negri bodies or suspicious forms are found in any of the slides, and the examined material is fresh, the diagnosis is, probably, not rabies. If suspicious forms are found in fresh material the diagnosis is probably rabies. If no definite forms are found in decomposing brains the diagnosis doubtful must be given.

In all cases where the diagnosis is uncertain, animals must be inoculated with a fine emulsion made from material taken from various parts of the brain, and pieces from surrounding parts should be prepared for sections. Pieces should also be taken from the gasserian and several spinal ganglia, for demonstrating the presence of the rabic tubercles as well as of the negri bodies.

Two rabbits or four guinea pigs should be used for the inoculations, which may either be subdural or intracerebral.

Animals should be kept under observation for at least three months before a negative diagnosis is made.

An emulsion from different parts of the brain should be made in sterilized neutral glycerine for later inoculations, if, for any reason, the first should be unsatisfactory.

Decomposed brains should be allowed to remain in the glycerine for one to three weeks before inoculation, unless very weak dilutions are used; in the latter case, negative results would necessitate another inoculation.

In order more thoroughly to test the specificity of the negri bodies and their absolute and comparative worth in rabies diagnosis, the committee suggests that copies of the following scheme, or one similar, for the study of this subject be sent to the directors of the different Pasteur Institutes and laboratories for medical research, which have worked, or expect to work, on rabies, with the request that such institutes undertake studies along lines indicated in the scheme and report their results to the committee.

ABSTRACT OF THE REPORT OF THE COMMITTEE ON STANDARD METHODS FOR THE BACTERIOLOGICAL DIAGNOSIS OF TUBERCULOSIS

The committee presents a tentative report of methods to act as guide until something more complete and better considered can be adopted.

The diagnosis of tuberculosis by bacteriological methods in the laboratory is applicable in four different ways. First, and most important, the examination of sputum. Second, the examination of urine. Third, the examination of pus and other discharges. Fourth, the examination of tissues. These will be considered in the order given:

First. We recommend that laboratories supply outfits for collecting sputum, consisting of a wide-mouthed bottle containing about 30 c.c., with a cork stopper, and suitably packed for mailing. It is better to put 3 to 5 c.c. of five per cent solution of carbolic acid in each bottle. Enclosed with the bottle is a leaflet giving directions for collecting sputum, and blank for the name of the physician sending in the case, the patient's name, date of collection and other data which circumstances in the laboratory render important. The directions for collecting sputum are as follows:

The first sputum raised in the morning is preferred. If this expectoration is scanty, save the entire amount coughed up in twenty-four hours. Be careful to avoid the contents of the stomach, particles of food, etc. Give only what is coughed up from the lung. Be sure that the cork is tightly inserted into the bottle, and that the outside of the bottle is well washed off before packing.

Second. Directions for collecting urine. This should always

be done by a physician or competent nurse. Great care should be taken to wash the meatus thoroughly, and the urine should be drawn with a sterile catheter into a sterile bottle (rubber or glass stopper), with the utmost precautions to avoid contamination, and sent at once to the laboratory. If, from a distance, it should be packed in ice.

Third. Directions for collecting pus. Pus from a freshly opened abscess is to be preferred. If an old sinus exists it should be scraped with a dull curette, and the scrapings be sent with as much pus as possible. Sputum bottles are convenient for the transportation of such material, but the carbolic acid should be washed out with sterile water.

Fourth. Tissues should be sent in sterile gauze, packed in ice.

Examination of sputum. For staining, carbol fuchsin is recommended. For decolorization, a mixture consisting of five parts nitric acid and ninety-five parts of 95 per cent alcohol is the most convenient. Those preferring it may use any of the mineral acids up to 10 per cent, but we advise against very strong solutions of acid. At least ten bacilli should be found before calling any specimen positive. Should the specimen prove negative by this simple examination, it may be digested with two per cent caustic potash solution then centrifugated and the sediment examined.

Pus is to be examined in the same manner.

Urine should be centrifugated, the supernatant fluid poured off, distilled water added, and a second centrifugation done. This is best repeated three times, and the sediment finally examined as for sputum. Special care must be exercised in fixing the sediment, however. If dried slowly, the danger of washing off is largely avoided.

In examinations of all material it may be necessary to resort to animal inoculation. It is especially important in cases of suspected genito-urinary tuberculosis.

In the examination of tissues the method proposed by Mallory and Wright is, perhaps, the best. The routine

differentiation of the tubercle bacillus from the smegma bacillus is best made by the method of Dahms, but animal inoculation should be resorted to in doubtful cases.

The committee recommends that the work of Much and Michelidès, and also of Herman, be repeated; and also that some experiments as to the retention of the staining characteristics of the tubercle bacillus in sputum be examined into.

M. P. RAVENEL,
Chairman.

COMMITTEE ON STANDARD METHODS FOR THE BACTERIAL DIAGNOSIS OF GLANDERS

By W. L. BEEBE
Chairman

The committee presents a statement of questions and answers bringing out points for further study, and reports a place for the continuation of the work.

For active diagnostic work until a more definite report can be made they recommend the following:

Mallein is probably the most reliable diagnostic agent that we have if it is properly applied. A typical reaction is constituted by a rise of temperature of 2.5 to 3 degrees over the highest normal temperature of the previous day, the temperature remaining high usually from twenty-four to forty-eight hours. In addition to the high temperature a painful local swelling at the point of injection and marked depression ought also be present. Occasionally a high temperature without a local swelling, or a local swelling without a temperature reaction is observed, but at this time the committee desires to make no recommendation as to how these animals should be disposed of.

Macroscopical agglutination is considered by many as being as reliable as mallein. It has recently been adopted by the Austrian Government, also by the Prussian army, as the official test. In this country it has a few stanch supporters, while others consider that it is not as reliable as mallein.

Microscopical agglutination has been tried, but is not considered as reliable as macroscopical.

Strauss' method is reliable providing *Bact. mallei* is obtained in pure cultures from the guinea pig. If orchitis fails to appear it is not safe to say that that material from which the inoculation was made did not contain *Bact. mallei*, as occasionally a guinea pig will not develop orchitis, but will eventually die from glanders, and upon post-mortem show the lesions elsewhere. Providing no orchitis is shown the guinea pig ought to be kept two months before it is destroyed.

Usually *Bact. mallei* can be obtained in pure cultures from pus that has been removed from abscesses under aseptic precautions, and occasionally it can be obtained from cultures taken from open ulcers.

The best culture media are potato and acid + 2.5 acid glycerine agar.

Report of Other Standard Methods Committees.

The following committees reported the collection of data indicating the lack of uniformity of methods and some of the reasons for the same, and presented plans for undertaking such experimental work as will be necessary to arrive at facts needed for the formulation of standard methods:

Committee on Standard Methods for the Preparation of Tuberculin and Mallein. Veranus A. Moore, Chairman.

Committee on Standard Methods of Chemical Milk Analysis. James O. Jordan, Chairman.

Committee on Standard Methods for the Laboratory Diagnosis of Syphilis. H. U. Williams, Chairman.

Committee on Standard Methods for the Preparation of Diphtheria Antitoxin. H. D. Pease, Chairman.

REPORT OF THE COMMITTEE ON STANDARD METHODS FOR THE BACTERIAL DIAGNOSIS OF DIPHTHERIA*

ABSTRACT

Organization. The machinery for distributing, collecting and receiving outfits must, necessarily, vary with the conditions, as found in State work, where outfits have to come long distances, and in city work where the distances are short. Hence the question, does harm come from drying during shipment, or from the antiseptic effect of metal (brass etc.) swab wires.

Even small details, such as the most useful test tubes, outfits, mailing cases and the like, are to be considered also the regulation of incubators (with maximum and minimum thermometers), and the making of nutrient serum. In the latter case such points as the usefulness of glycerine should be taken up. Methods of record and report may well be considered here also.

Technical Details. The A, C and D types are usually considered as positive, under any conditions, but the exact weight to be given to the other types, especially in release, is unsettled. The largest and most important part of the work of the committee must be done here. The plan adopted by the committee is as follows:

1. Preparation of large amount of serum and Loeffler's methylene blue to be distributed among the committee members.

2. Adoption of standard incubator temperature and time of incubation.

* Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

3. Inoculation by each laboratory on the common culture serum from the serum of positive cases.

4. Preparation and staining of the bacteria grown at standard temperature, and for the selected time with tabulation of results.

5. Interchange of slides and recording of forms.

6. Records sent to the chairman of the committee for comparison, etc.

Thus the only variable factors in the above scheme will be the personal equation and the locality.

Suspicious or Atypical Forms. The status of these forms would be, at least, partially determined in the work outlined above. The Committee suggests the advisability of various laboratories interchanging with other laboratories and studying in detail diphtheria-like organisms isolated from routine and other sources, in particular those organisms which (e. g. Hoag's bacillus X) morphologically are like K. L., but which differ materially in their biochemical reactions. The committee will organize such an exchange system, and act as a clearing house for it. Non-virulent organisms giving the reactions of the diphtheria bacillus also require study.

Virulence Tests. These will be made on a uniform basis agreed upon by the committee.

Optimum Time of Incubation and Symbiosis will be outlined also.

B. R. RICKARDS,
Chairman.

Section on Vital Statistics.

ADDRESS OF THE CHAIRMAN, J. N. HURTY, M.D.
Secretary State Board of Health of Indiana.

To Dr. Cressy L. Wilbur is due quite all of the credit for the organization of this section. That the section was needed, that it has a good work to do, appears upon the surface. The resolution leading to the organization of the section was written by Dr. Wilbur and presented by myself at the meeting in Mexico City in 1906. The question had been informally discussed, and the authorization for organization was passed without dissent. As all here know, the final forming of the section was accomplished at the annual meeting of the Association at Atlantic City in June, 1907. In anticipation of successful consummation, Dr. Wilbur aroused the interest and secured the attendance of a number of earnest workers in vital statistics, and, in addition, arranged an excellent program. Certainly no greater success ever attended a like effort, and this much of history is given, for possibly it may have future usefulness.

THE WORK AHEAD. What shall this section do? A work must be done, something must be accomplished, a structure must be built. The importance of collecting accurate vital statistics and drawing from them the lesson they contain, need hardly be discussed; but it seems not inappropriate to note that the life history of population is of great importance, and that vital statistics comprises the analysis and synthesis of the said life history. For a civilized people to have accurate knowledge of their wealth, to know

the amount and value of the crops of the land, to know fiscal relations and facts, are not of more importance to them than to know about themselves.

Being born is both a serious and a joyous matter; and it is stupid, indeed, for any civilized State not to have accurate records of all births; and, as for records of diseases and deaths, the importance of collecting, tabulating and analyzing them should be understood by even a wayfaring man, though he be a fool. Yet, what has been done in the matter by the free and independent and civilized States of North America?

THE SITUATION. The situation is not discouraging, nor is it flattering. Free schools exist in every State, orderly government prevails, the courts everywhere are pure, literature, art and science flourish, and honor and righteousness control; yet, at this time, only fifteen States comprise the registration area, and their registration is not what it should be for deaths; and as for births registration is woefully deficient. The vital statistics of the National Government, as collected deceniallv, are a failure, and the method is abandoned. It is, indeed, humiliating to acknowledge that not a State in the Union knows with the accuracy it should know, its birth and death rate. We have fuller and more accurate knowledge of the number of sheep, mules, chickens and hogs, and of the number of deaths caused among them by disease, than we have of ourselves. A great National Bureau, supported by millions of dollars, exists to study and to stay disease among the lower animals and the plants; but the like for the human family has not yet appeared.

As vital statistics are the measure and the compass of hygiene and sanitary science, and as health is the basis of all wealth and power, it seems strange, indeed, that we practical Americans have not long since grasped the situation and acted upon it; however, the indications are favorable. As was shown by Dr. Wilbur in his address at Atlantic City last year, not one of the States having accurate systems of

registration has discontinued since 1904. In 1901 Illinois slid backward, and Iowa in 1904 did likewise by repealing their laws; both, seemingly, not being mentally ready for the bath and the clean clothes.

Other favorable conditions are the excellent work of the American Statistical Association, the action of the American Medical Association, the organization of this section, and the general interest which is certainly rising.

The anti-tuberculosis movement, which is engaging the attention of the public, as well as the interest which is quite everywhere being manifested in public health work, are also encouraging factors; for how is it possible for the people to become interested in public health work, and not finally see clearly the necessity of the State collecting accurate vital statistics? This is possibly the principal reason why the cause of vital statistics has advanced more rapidly in cities than in the States, inasmuch as disease prevention work is more advanced in the centers of population.

A certain class of physicians greatly obstruct the collection of accurate records in Indiana, and possibly, a like class in non-registration States constitute a block to progress. We find in Indiana that this class cannot be induced to take an interest in the work which so greatly concerns the science of medicine, the family and the State. The members are not always ignorant, but generally are. These men require continuous watching to secure from them the data which the law commands they shall supply. But more than this, the educated and strong members of the class tell their patients that State records of deaths, births and diseases constitute an invasion of family privacy. To nullify this pernicious and hateful influence is very difficult. Henry Ward Beecher once said: "The church had many strong enemies within her walls." It may also be truly said that the cause of registration would have advanced further and would have advanced more rapidly, had not opposition existed within the medical profession.

The frequent changes in health boards on account of politics, is another cause of delay. Any and all doctors are hygienists, is the belief of the appointing powers, whose great aim is to advance their individual cause; however, this fault is disappearing, and finally, when health officers enjoy permanence in office and there is reasonable anticipation of the privilege of working in a good and interesting cause, then there will be no lack of understanding nor lack of enthusiasm, as now exists in certain quarters.

THE OUTLOOK. The outlook, I feel sure, is promising. Anyhow, there is no reason for discouragement or impatience. We do not desire revolution, for the results of evolution are more permanent. Time is required for education and evolution, but their results are lasting.

A twinkle of encouragement appears in a recent work undertaken by the International Association for Labor Legislation. This organization is trying to collect data concerning the relation of occupation to cause of death. The data is wanted principally for selfish purposes; but its need brings the importance of vital statistics forcibly to the attention of a class whose help will prove highly valuable. One Indianapolis paper became interested in occupational causes of death on account of the circular letter of the association just named and, upon finding that the State Board of Health could not furnish the data desired because of lack of funds to collect the same, gave a strong editorial upon the importance of vital statistics; and now we are trying to arouse all labor associations, and they are becoming interested and active. It is thus progress is made, and I have no doubt we will be able at the next session of our legislature to secure a better appropriation for statistical work.

The Indiana Board of Health began January 1, 1908, to collect birth records. Our law is not all it should be, but it is capable of doing passable work; its greatest defect being a clause allowing twenty days in which to report. And

this clause was insisted upon by a medical member of the legislature at the time the law was passed. Had we had laymen only to deal with the defect would not exist. In the first month of our work the number of births collected checked fairly with our calculations as to what the birth rate should be, and very soon two difficulties in the way of accuracy appeared. The first was the old difficulty met with in collecting death records, namely, the doctors. The second was the lack of understanding and interest of parents. As to the delinquent doctors, I fear it will be more difficult to educate them and secure their coöperation than it will be to secure the attention and coöperation of the laity. In the first six months of this year we sent the following letter to every mother whose child was not named in the certificate:

"We have received at this office for legal record the birth certificate of your baby. Please fill out the inclosed blank where child's name is called for and return to us in the stamped and addressed envelope, and please correct any errors, either of dates or spelling of the names.

"This legal record of the birth and name of your child is of great importance to you, to your child and to the State. The record is frequently needed by those who least expect it. Some day it may be required in court to prove your child's parentage, or to prove inheritance of property, or to prove right to insurance or pension, or to prove legitimacy. Every mother should demand that her child's birth be legally recorded as the law commands; and also demand that the physician or midwife carefully look after the matter, for their duties are not fulfilled and they should not be paid for their services until they make the report required by law. Women will do wisely to discuss with each other the importance to themselves and to their children of legal records of births and deaths.

"If at any time the State Board of Health can help you, please write to us. Thanking you for your kind reply, and wishing you all happiness, etc."

Despite the requirement that omitted names should be supplied on supplemental blanks by the physicians or midwives attending the births, still every month we had over 2,000 birth certificates without names. Our letter to mothers usually brought the names, but for lack of funds we have been compelled to discontinue the plans, and now our collection of births languishes. Our letter also served the purpose of educating the people in the importance of collecting vital statistics, and certainly had a good effect, as is proven by letters from the people in response. Our regret at being compelled to stop the good work on account of lack of funds is, of course, considerable; but that defect will be remedied in another year if the M.D. members of the legislature do not too strongly oppose.

Perhaps the most important work before us is the adoption of rules of statistical practice. This will, doubtless, be done with wisdom, and then comes the practical working of them, a matter which will be attended with difficulties; but no difficulties shall be allowed to discourage.

There must be full consideration of rules. We must do our work well and thoroughly. First, comes statistical definitions of deaths, stillbirths and births. Second, requirements of registration of deaths and births. Third, methods of testing accuracy. Fourth, adoption of uniform age periods in death statistics. Fifth, statement of cause of death. Sixth, occupation. Seventh, the adoption of standard tables and uniform methods of analysis.

ACTION. We now are in action. Not until the last year, marked by the organization of this section, has anything been done with vital statistics in this association but talk. We shall now proceed with intelligent and persistent energy. Mere talk about the importance of vital statistics shall cease. When Demosthenes was asked the first element of successful oratory he said, "Action." When asked the

second he again said, "Action"; and the third and all other reqirements were stated to be "Action."

The Section on Vital Statistics of the American Health Association is now in action. Let the battle proceed.

THE MORTALITY FROM INDUSTRIAL DISEASES*

By L. W. HUTCHCROFT

Statistician for the Wisconsin State Bureau of Vital Statistics

The subject of occupational diseases, their extent, cause and methods of prevention, has not received the attention that it should in the United States. This is partly accounted for by the lack of a uniform system of vital statistics whereby the causes of mortality for the country, as a whole, can be compiled and the relation of occupation to cause of death ascertained. Another factor which, until recently, has made it impossible to obtain the facts necessary for a proper understanding of the subject, is the "*laissez faire*" policy of the various States in regulating conditions of employment.

In attempting to summarize what has been done in the various States to investigate the extent, nature and cause of occupational diseases, we must keep clearly in mind that, with the exception of two or three investigations which have been made of certain isolated industries, practically nothing has been done. A large part of the available material has been given us by attempts to investigate the unhealthful environment of certain industries, and not with the prime object of ascertaining what diseases are prevalent in any given industry.

It is to be regretted that no serious attempt has ever been made to do research work in this country along the line of occupational diseases. The many foreign reports which are constantly being quoted whenever the subject is discussed,

* Read before the Section on Vital Statistics of the American Public Health Association at Winnipeg, August, 1908.

are not sufficient for an intelligent understanding of the subject in a country where the habits and temperaments of the working men and conditions of employment are so radically different. At any event, the subject is of sufficient importance to warrant a thorough and impartial investigation of home industries, both by the State and through private organizations. The most that can be done at this time is to point out the necessity for action and suggest methods for obtaining the desired facts.

The conditions under which labor is performed, especially factory labor, is now a subject of much concern and, as a result, most progressive States have passed general laws which are designed to improve the hygienic conditions of factories and workshops; however, a large part of our factory legislation is based upon the filth theory of disease, and never will accomplish anything to protect the laborer from dangerous dusts, gases or materials, unless revised. The statutes which we now have in several States requiring the use of protective devices, and providing more sanitary environment for the laborer, have come about from an investigation of conditions as they exist rather than from a study of the results in disease and mortality from any given occupation. Such laws are general in their character, and were passed to meet a popular demand for some sort of regulation. They do not protect the wage earner from the dangers to which he is exposed in some industries, even though some one in authority is clothed with the power to prohibit employment in "dangerous trades" until the dangers have been removed.

Indisputable evidence must be presented to show what trades are dangerous to health, and then specific statutes containing a penalty clause for violation should be enacted to meet the exigencies of the case. Such laws should be enforceable under the police powers of the State, as they are in Belgium.

The great similarity of legislation in the various States is sufficient proof that little, if any, original work has been

done in any State to meet conditions quite dissimilar to those in other parts of the country. Too much attention has been paid to purely industrial and economic problems and not enough to the importance of the health and well-being of our people. A healthy people is the most valuable asset to the State, and is less carefully guarded than any other.

The most valuable work that the State can do, and, in fact, the only part it should take in eradicating disease, is to insist upon the adoption of preventive measures. If the cigar factories are unsanitary and improperly constructed, it is the proper business of the State to see that all agents dangerous to health are removed, rather than to provide curative treatment for those who have contracted a disease as a result of employment in an unhealthful factory. The factory development of the country is yet in its infancy, and if we would protect the vast army of laborers of the future something must be done to point out the unhealthful occupations and provide adequate protection for the people who find it necessary to follow any given trade.

Excluding the element of cleanliness, which has been emphasized at the expense of a more careful study of diseases incident to occupation, the laborer is entitled to pure air, moderately heated. When this can be obtained, unhealthful influences, such as dust and noxious gases incident to occupation, will be reduced to a minimum. The question of ventilation, heating and lighting is not given sufficient consideration and, as a result, the factory is usually constructed to meet the mechanical requirements of the industry as they have come to be understood, without regard for the health of the workmen, except, possibly, the few employed in the business office.

Strange as it may seem, the laborer will not protect himself, even though the means for protection are provided. In order to accomplish something for the protection of workingmen whose health is constantly endangered by occupation, there is an urgent need, if not a demand, for more sanitary

administration and better protective devices. It is the duty of the State to prohibit, under the penalty of a fine or imprisonment, the carrying on of a trade in such a manner as to produce disease and death.

The machinery necessary to make original investigations and collect data for the guidance of legislation, should preferably be provided as a part of the State health organization; however, with but few exceptions, the State boards of health are not provided with the necessary funds to do satisfactory work in the most important of all branches of preventive medicine; namely, the hygiene of employment.

Most State health departments are clothed with ample authority to provide for labor, clean floors and walls, proper ventilation, light and sanitary drains. They cannot, however, determine that a certain occupation is dangerous to health or causes certain diseases without data, showing an excessive death rate among employees in the industry. Reliable statistics have not been compiled, and until we have some data showing the relation of occupation to certain diseases, public interest cannot be aroused.

The condition of woman, on account of her small wage and susceptability to disease, when compelled to labor in unsanitary shops cannot be too strongly emphasized. Certainly there is an urgent demand for better statistics showing the exten to which woman has entered the gainful occupations and the effect of the employment upon her health. Statistics taken from foreign reports show conclusively that, under certain conditions, the employment of women, where any lead products are manufactured or handled, should be absolutely prohibited. From the standpoint of the individual, this is necessary in order to preserve health and, as a matter of public policy on the part of the State, there is a still greater demand for legislation along this line.

The effect of inhaling large quantities of apparently harmless dust, such as coal dust, has never been definitely determined. In some foreign countries, where the question is

being investigated, a form of sarcoma, or tumor, has been attributed to this cause. The hook-worm disease, prevalent among miners in the Southern States, is also a fruitful subject for investigation. Germany has distributed throughout the empire pamphlets setting forth the nature of the disease and approved methods of prevention.

The relation of inhaling dust-laden air to pneumonia is an open question, but there is indisputable evidence that the irritation set up in the lungs by the introduction of certain forms of dust presents a very fertile field for the pneumonia cocci. On account of the micro-organisms contained in the material which workmen are often required to handle, wool, hair and hide workers, rag pickers, rope makers, button makers, etc., are in great danger of contracting anthrax, glanders, conjunctivitis and malignant pustular diseases, unless care is exercised.

As proof of the unhealthfulness of certain occupations in England, Dr. Ogle has found that the general death rate in England among men from twenty-five to forty-five years of age is 10.1 per thousand; while for typesetters the rate is 11.1; for chimney sweeps, 13.7; brewers, 13.9; file cutters, 15.3; and inn keepers and servants, 18 per thousand.

Considering the mortality among clergymen as 100, Dr. Ogle has also compiled the following table showing the comparative death rates for various occupations:

Gardeners	108	Bookbinders	210
Agricultural laborers	126	Quarrymen	202
Fishermen	143	Leadworkers, painters, glazers	216
Carpenters	148	Cutlers	235
Shoemakers	166	Coachmen	267
Bakers and millers	172	Brewers	245
Masons	174	File cutters	300
Cabinetmakers	173	Potters	313
Workers in wool man'res	186	Inn servants	397
Workers in cotton man'res	196		
Printers	193		

At the Munich Polyclinic in Germany, where 1,425 cases of tuberculosis were treated, 30 per cent of the patients

had been exposed to metallic dust; 18 per cent to mineral dust; 26 per cent to vegetable dust; 17 per cent to mixed dust; and 8 per cent to animal dust. The Munich authorities have also made an extended investigation of the relation of tuberculosis to stone workers, and have found that 40 per cent of the mill stone workers were tubercular.

The industrial experience of the Prudential Insurance Company from 1897 to 1905, as compiled by Mr. F. L. Hoffman, gives some valuable side lights on the relation of occupation to tuberculosis. This is one of the most valuable contributions to the subject of industrial diseases, and it is to be regretted that the data are, of necessity, too incomplete to formulate general statements for each industry. The following extract is taken from the tables prepared by Mr. Hoffman:

Occupation	Total Deaths	Deaths from Pulmonary Tuberculosis	Per Cent of Deaths from Tuberculosis To Total Dths	Per Cent of Deaths from Tuberculosis At Ages 25-34	Per Cent of Deaths from Tuberculosis At Ages 35-44
Steel grinders,	117	60	52.1	72.7	62.9
Metal polishers,	255	98	40.4	55.7	44.3
Tool makers,	264	89	24.8	57.4	37.1
Engravers,	164	61	38.4	61.	47.5
Stone workers,	763	274	36.7	52.4	48.4
Potters,	346	110	33.	54.7	40.8
Glass workers,	716	213	30.8	49.7	32.3
Glass blowers,	251	76	30.3	57.7	25.
Printers,	1,384	527	39.3	55.4	39.1
Compositors,	147	53	36.1	66.7	39.3
Pressmen,	178	81	45.5	50.	53.1
Hatters,	750	248	34.4	54.2	46.
Cigar makers,	1,349	389	29.8	54.3	43.6
Spinners,	167	50	31.1	54.5	44.1
Weavers,	818	228	28.8	55.4	39.3

The following table published by Mr. Nodler in the Minnesota *Journal* for Oct. 1, 1905, shows the ratio of deaths in eighteen other trades to deaths among farmers:

Farmers	602	Cotton mills	1,141
File workers	1,810	Printers	1,096
Lead workers	1,783	Coopers	1,083
Potters	1,702	Brick and stone	1,001
Cutlers	1,516	Wool	994
Glass blowers	1,487	Tin	991
Copper workers	1,381	Carpet weavers	973
Iron and steel	1,301	Bakers	920
Zinc	1,198	Blacksmiths	914
Stone quarries	1,176		

Care must be exercised in distinguishing between the influence of occupation and the habits of the workers when an unusually high death rate is found for any given industry. It would, therefore, be extremely valuable to require the medical part of the death certificate to show the relation of the occupation to the cause of death. Such information, however, if correctly stated, would necessitate careful investigation on the part of the person required to answer the question and, on account of a lack of knowledge regarding the exact relation of occupation to disease, the question would probably be unanswered. Again, the physician will often be reluctant about expressing as a fact for public record what is only a matter of personal opinion. One of our greatest difficulties, at the present time, is to induce physicians to fill out the medical certificate of the cause of death so that the sequence of diseases, provided there is a complication, can be shown.

A much better plan, and one which will give valuable data for study in other lines, is to obtain what might be called an "occupational history." Instead of merely asking for the occupation of the deceased, the present occupation, if any, with its duration, and former occupation, with the duration of each in years, should be obtained. On the standard death certificate these items will be obtained as a part of the "personal and statistical" particulars and are, therefore, easily acquired, since this part of the death certificate is, in most cases, filled out by a near relative, or some one intimately associated with the deceased.

For the purpose of getting the facts whereby a proper study of occupational diseases can be made, this method, or a similar one, has another advantage which should be carefully considered, namely, the information can be obtained in every State now using the standard death certificate without any change in existing laws.

The vital importance of stating the occupation in definite terms cannot be too strongly emphasized. Any attempt

to classify our mortality statistics by occupations shows an unusually large class of decedents, whose only occupation is given as "laborer" or "domestic servant." Such a statement is quite valueless as a statistical record, and should not be accepted by registration authorities when more definite information can be obtained.

On account of a lack of uniformity and completeness among the various States, and by the Federal Census Bureau in collecting statistics of occupation, it is impossible to determine true death rates for any considerable number of occupations. We can, however, obtain comparatively accurate estimates of mortality rates by industries. A comparison of these rates, with the death rate for the entire male or female population in a given age group, will reveal, at a glance, the industries in which there is an abnormal death rate. The diseases peculiar to each industry can also be determined from the mortality reports. Where the industry is centralized there should be little difficulty in determining what destructive agencies are at work. Dr. Gilbert states that every disease recognized as particularly frequent in a profession ought to be considered as an industrial disease to the extent that it is clearly due to the risk in the trade.

It is very evident, from the division of labor which has come about in most of our industries, that the work done by one set of laborers in an industry might be very unhealthful and cause some special form of occupational disease, while the employees in the remainder of the industry might not be subject to any destructive agencies. It is the particular branch of the industry which develops an occupational disease with which we are concerned, although for purposes of comparison it would seem desirable to study the industry as a whole. Dr. W. A. King states that the general distinction of what a person does and the conditions surrounding his employment is of most importance in a study of mortality based on occupation.

THE NEED OF GREATER UNIFORMITY AND ACCURACY IN STATISTICAL EXPRESSION.*

By FREDERICK S. CRUM, Ph.D.
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In the physical sciences it is necessary that the various observers and experimenters employ exact and comparable methods and instruments in measuring the bulk, temperature, weight, etc., of gases, liquids and solids. In the same manner accuracy and uniformity of standards is necessary in such instruments as are employed to measure time, motion and space. The social sciences are less exact than the so-called physical sciences, in part because the subjects with which the former deal are not so amenable to rod and rule as those embraced in the latter. There must, in the nature of things, always be a difference in exactness between the solution of such problems as calculating the time of the return of a comet, or the location of a ship at sea, and the calculation of the divorce or suicide rates of a given population. Because it is not possible to be as exact in the social sciences as in the natural or physical sciences, it is all the more important that observers and workers in the former field exercise every precaution to be as accurate in their measurements of social phenomena as possible. Otherwise, the efforts to deduce conclusions, as to the present or future, from the observation of past experience, will be likely to prove misleading rather than trustworthy.

* Read before the Section of Vital Statistics of the American Public Health Association at Winnipeg, August, 1908.

Without going very far into the subject here suggested, I wish to direct attention to one or two common errors which are met with in official reports and other supposedly reliable sources, where accurate statements are expected, and where needlessly inaccurate statements would appear to be inexcusable. The expression "per cent per thousand" is one quite frequently met with in official reports on mortality and sickness, and in otherwise carefully edited periodicals and newspapers. The phrase is, of course, meaningless, for per cent, or per centum, signifies by the hundred, or parts of a hundred. Many illustrations of this loose and meaningless phrase could be brought forward but a few will suffice for my purpose. One of the most carefully edited of our American newspapers has editorially stated that, "according to the most authoritative of recent statistics of suicide, the country in civilization where the rate per thousand living is greatest is Saxony, with 31.1 per cent, while in the United States it is only 3.5 per cent." The rates quoted were, as a matter of fact, rates per hundred thousand of population. Again, the same newspaper printed a Washington despatch referring to army losses in Cuba in which the following phrase was used: "The percentage of loss was 1.25 per thousand." In a recent otherwise carefully prepared and comprehensive publication of the Carnegie Institution I find the phrase "per cent per thousand." In an official report of Western Australia I find the following statement referring to the fatal accident rate of men employed in mines: "As compared with that of the previous year the death rate of 2.52 per cent per thousand men employed at all mines has slightly decreased." Again, in the last issue of an official report of Buenos Ayres, I find the following table heading: "Total deaths in the city, from several diseases of the last twenty years, for each 10,000 inhabitants, showing percentages of each disease." As a matter of fact, the table gives rates per 10,000 of population, no more and no less.

One other point, also, is deserving of careful and critical

consideration by those who are responsible for the compilation of vital statistics and the calculation of death rates. Is it necessary or advisable to express the death rates from specific causes of death in terms of 100,000 of population? It seems to me that a more proper, because more convenient and just as accurate, basis would be 10,000 of population. The U. S. Census office uses the 100,000 basis, but it seems to me that it is only a degree better than the 1,000,000 basis used by the Registrar-General of England. What are wanted are conveniently-comparable rates, and if there is one integer in practically all of the rates that is entirely sufficient. On the 10,000 basis all of the principal causes of death would show rates with at least one integer and, if necessary, the rates could be carried to two places for causes yielding comparatively few deaths, such as alcoholism, homicide, etc.

As the matter now stands there is no uniformity. Some reports give death rates from specific causes per 1,000,000 population; some per 100,000; and some per 10,000. After long and varied experience in the use of death rates, my decided preference is for death rates per 1,000 of population when all causes in the aggregate, and all causes by specific age periods are concerned; the basis to be 10,000 of population when the death rates are calculated for specific causes of death.

In this connection I wish to call attention to what I consider a convenient and altogether admirable short-cut expression for the phrase per 1,000. The expression 0/00 is in quite general use in foreign statistical publications and it seems to me to be an admirable one to employ where brevity is desirable, particularly in table headings. If death rates were never calculated on a basis beyond 10,000 population, the signs 0/0, 0/00, and 0/000 could be very conveniently employed to express *per cent*, *per thousand*, and *per ten thousand*, respectively; and this, it seems to me, is another strong argument in favor of death rates per ten thousand where specific causes of death are involved.

There is great need of an early organized effort to secure uniformity of practice, both in the form of expression of statistical statements and in the mathematical expression of statistical facts.

NOTIFICATION AND MORBILITY RETURNS IN CUBA WITH SPECIAL REFERENCE TO YELLOW FEVER AND OTHER MAJOR INFECTIOUS DISEASES

By CARLOS J. FINLEY, M.D.
Chief of the National Sanitary Department of the Republic

Obligatory notification of cases of yellow fever was an unprecedented innovation in the island of Cuba when orders to that effect were issued for the first time in this country, in 1899, by the U. S. Military Government after the war with Spain. The generality of physicians, as well as the rest of the population, held the belief that yellow fever was caused by miasmatic emanations, or by special atmospheric conditions, and being persuaded that the disease was in no wise contagious, the exaction of the aforesaid notification was considered as a superfluous measure without adequate justification. Knowing this, it had been no matter of surprise, either to myself or to my diligent collaborator, Dr. Claudio Delgado, that so little attention had been paid to the persistent arguments and frequent presentation of new facts in support of our personal conviction that the only means by which yellow fever could be transmitted from man to man was through the bites of mosquitoes of the Stegomyia species that had previously bitten yellow fever patients.

Even after the admirable confirmation of this hypothesis by Major Reed's Havana Yellow Fever Commission, as proclaimed at the meeting of the Pan-American Congress held in this city, February, 1901, the new doctrine counted but

few adherents; but their number was materially increased after Major W. C. Gorgas' splendid archievement of completely stamping out the disease, in the space of seven months, by measures exclusively based on the findings of that commission.

The most important additions made by Reed's Havana Yellow Fever Commission to my own hypothesis, had been their demonstration of a definite incubation period for the yellow fever germ, both in its mosquito host and in the human host, and the fact that the yellow fever patient is infectious for the mosquito only during the first four days of his attack, and not during the first six days as I had assumed. The knowledge of these facts now made it all the more imperious that the occurrence of every new case should be promptly notified in order to curtail the infection of mosquitos, and Major Gorgas' wonderful success in 1901 was only made possible by his sagacious combination of a more strict enforcement of prompt notification of all new cases of suspects, together with a very active campaign, undertaken at the most favorable season, for the destruction of all breeding places for the yellow fever mosquito. Under the conditions, which at that time prevailed in the Island (difficult overland travel, absence of great central sugar estates such as have subsequently been established, and comparatively small proportions of non-immune Spanish laborers), under these conditions, I say, the immunization of the districts under the immediate control of Major W. C. Gorgas constituted an effective safeguard for the rest of the Island.

With patients belonging to the higher classes any delay in notifying a new case may, as a rule, be attributed to neglect on the part of the attending physician, but it is otherwise with the poor, analphabetic laborers who grudge every cent of money spent for obtaining medical advice, and only consult a physician as a last resource. Fortunately, however, in Havana and in most towns of some importance in different

parts of the Island, there are special private hospitals, *Quintas de Salud*, where, by contributing a monthly quota of one and a half dollars, the subscribers are entitled to admission and treatment without any additional expense, and most of the non-immune immigrants avail themselves of these advantageous conditions. The number of subscribers to those *quintas* in Havana alone amounts to over 60,000, and with this large income those *quintas* are able to keep their establishements in good shape and, as a rule, they have readily complied with the requirements of the sanitary department. The directors of these hospitals are responsible for the prompt notification of all suspects, and any omission to do so would be discovered by our inspectors who visit those hospitals daily.

Every case at all suspicious has always been carefully investigated by competent experts, not only regarding the diagnosis, but also as to its probable origin and places visited by the patient during the first days of his attack.

As a rule, whenever a first case or group of cases, has been recognized and tracked before the expiration of the mosquito-incubation period, that is, within the first week after the invasion, it has been possible to control the spread of the disease by the usual prophylactic measures, which include effective fumigation of the patient's dwelling, as well as of the places where he is likely to have become infected and those which he may himself have infected; careful vigilance over all non-immunes within the infected zone, and special attention to the removal of all breeding places for mosquitoes within the infected area.

It was owing to the lack of information regarding the first two cases which occurred in Havana in October, 1905, that the disease obtained once more a foothold on the Island. The cause of death in those two cases had been wrongly attributed to nephritis and to *icterus gravis*, respectively. But this was only recognized a fortnight after the first invasion; moreover, the original focus (a very unusual one) was

only suspected after the second week of November. This focus was, in all probability, the passenger's landing station on the Havana wharf. The first clue which led to its discovery was the fact that among the first eleven cases that had been recorded in Havana three had been attacked on the third. fourth and fifth day of their landing. These three persons had proceeded from New York or from other non-infected ports of the North; they had each come on separate non-infected vessels, and had taken their quarters in different houses or hotels, where no previous cases had occurred. The landing station was then thoroughly fumigated and the operation again periodically repeated till the end of the epidemic; and in the next two and a half years, during which yellow fever cases have occurred on this Island, never again has another invasion been recorded so closely following after the arrival of the person on these shores.

The three successive epidemic outbreaks of yellow fever corresponding to the years 1905, 1906, 1907 and 1908, when the epidemic may be considered to have been finally extinguished, have produced the following number of cases and deaths:

	Cases	Deaths
1905, October to December 31	77	24
1906, January to December 31	112	33
1907, January to December 31	168	56
1908, January to August 18	43	9

Smallpox, the extinction of which had been the foremost preoccupation of the U. S. Military Government since January, 1899, had been finally stamped out completely under Major W. C. Gorgas' sanitary administration in 1900; and since the inauguration of the Cuban Sanitary Department the whole territory of the republic has continued free from the disease, notwithstanding the introduction of imported cases on several occasions, and the occurrence of two secondary cases which developed in consequence of wanton exposure, while two of the imported ones were being treated at Las Animas Hospital. The spread of the disease was, however,

effectually prevented by isolation of the patients, and prompt vaccination of all non-immunes within a wide area in that quarter of the city.

Regarding all other diseases, with the exception of a brief epidemic outbreak of scarlet fever in the district of Havana, from September, 1903, to the end of January, 1904, the whole territory of the Republic of Cuba has remained free from any epidemic up to the present date. The rise and fall of the monthly mortality, having oscillated as usual, tuberculosis being the most important factor during the cooler months, while enteritis, under two years of age, takes the lead during the summer season, except in the district of Havana, where means are provided for obtaining a more satisfactory milk supply.

According to our sanitary ordinances, the diseases for which notification is required, are the following (classed simply in Spanish alphabetic order):

Beriberi, Colera asiatico, Dengue (in non-immunes to yellow fever), Diphtheria, Epidemic Dysentery, Escarlatina (Scarlet fever), Fiebre amarilla (Yellow fever), Fiebre tifoidea (Typhoid), Ictero grave (in non-immunes to yellow fever), Lepra, Meningitis cerebro espinal epidemia, Muermo y farcino (Glanders), Peste bubónica, Rabia (Rabies), Sarampión (Measles), Tetanos en recien nacidos (Neonatorum), Tifus exantomatico, Tuberculosis pulmonar é intestinal, Viruela (Smallpox).

Strict compliance with this order is, however, only enforced at all times for the major infectious diseases and, under special circumstances, for such of the minor diseases which might serve as an excuse for not reporting some of the major ones which threaten to assume epidemic form.

Municipal Health Officers' Section.

PROTECTION OF PUBLIC MILK SUPPLIES FROM SPECIMENS CONTAMINATED WITH PUS ORGANISMS

By JAMES O. JORDAN

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An important and frequently neglected factor in procuring a clean milk supply is the elimination of specimens contaminated with pus organisms. Although these samples, indicative of udder complications, cannot all be excluded, a persistent effort should be inaugurated in the attempt to reduce their number to a minimum. With milk supplies of large cities the only practical method for municipal health officers appears to be microscopic examinations of specimens, and where streptococci or excess of pus are indicated prohibiting the sale of milk from the faulty sources, until such time as the conditions become normal.

It is not the province of this paper to deal with the methods which are to be employed in determining the extent of infection by pyogenic organisms; but while good methods are essential, likewise correct interpretation of results, little progress can be made if too much time is devoted to the leucocyte pus controversy, or to the significance to be attached to the finding of streptococci, either in limited or large amounts. The practical and necessary problem is not argument, but

that of exclusion of milk from unhealthy animals. A system which has brought satisfactory results is that adopted in Boston in 1905. Beginning at that time, samples were collected almost daily, and subsequently examined at the Bacteriological Laboratory, under direction of Mr. B. R. Rickards. The findings, when completed, were reported to the Bureau of Milk Inspection, by which office the collections were also made. Samples containing streptococci and all those reported as contaminated with pus, namely, those having fifty or more pus cells to the one-twelfth immersion field, *i.e.*, about 500,000 pus cells to a cubic centimeter, were deemed actionable, and where the milk was from a definite source, future supplies from that quarter were excluded until the milk became normal. Where the objectionable sample was of mixed milk an effort was made to discover and eliminate the faulty dairy.

While this policy was at first viewed by dealers with disfavor, there is, at the present time, less opposition to the exclusion of infected milk than has been hitherto evidenced over this prohibitive mandate. That the above course has brought about a lessening in the number of these objectionable specimens can be demonstrated by the following figures:

Year	*Number of Samples Examined*	*Per Cent of Infected Samples*
1905	5.559	10.48
1906	5.007	4.90
1907	4.609	1.10

Since beginning the exclusion of infected milk the contracting or wholesale firms have established bacteriological laboratories for examining their own supplies. Their aid in the detection and debarment of abnormal specimens has been a potent factor in reducing the number of undesirable samples. In 1906, of 27,000 bacteriologic examinations made by these firms, 1,300, or 4.81 per cent, proved to be infected. During 1907 the same firms examined 29,208 samples, and 928, or 3.17 per cent, were classified as containing

pus or streptococci. When the milk was found to be at fault, prompt notice of this fact was sent to the producer, and the product of the animals in question, as soon as ascertained by subsequent examination of samples from individual cows, was excluded from the supply. This attitude on the part of wholesale firms is commendable, and no doubt has assisted materially in reducing the amount of objectionable milk.

The Bureau of Milk Inspection has not been content with excluding these abnormal milks, but in every instance an effort has been made to ascertain the condition of the cows at the dairies at fault. The data obtained in this search for information was procured, for the most part, through the assistance of the contractor. Experience has demonstrated, however, that it is impossible to obtain the facts in each instance without personal investigation, and for several reasons that course has been impossible. The list which appears below offers ample evidence, however, that much of the infected milk might have been excluded by dairymen who were both observant and considerate of the public welfare. In some instances negligence was apparent, but in other cases positive disregard of the consumers' interest was demonstrated.

The following is a summary of some of these investigations of dairies (referred to by numbers), the milk from which was contaminated with either streptococci, pus, or pus and streptococci. (In some instances the findings denote mixed infection.)

1. Two cows with pulmonary tuberculosis; both were subsequently killed. One cow about to drop calf.
2. One cow about to calve.
3. Two gargety cows; one chronic. One five-teated cow giving milk from only two teats.
4. Cows in poor physical condition; these were immediately sold.

5. Herd subjected to tuberculin test; the cows responding being sold.
6. Cow with hard udder.
7. Cow with lumpy udder, thought to be due to calf leaving cow when the latter was in full milk.
8. Cow with inflamed udder from having been hooked by another animal.
9. One tuberculous cow, which was killed. One cow with three teats. Subsequent to the exclusion of the milk from these cows, the contractor learned that the milkmen whom he supplied had persistently refused, on the physical test of taste and smell, to use this milk, but after its elimination the same dealers were buying the milk of this dairy with apparent satisfaction.
10. Two hind quarters of the udder of one cow badly congested; apparently had been in this condition for some time.
11. Two cows responded to tuberculin test; they were killed.
12. Trouble due to use of milk from a three-teated cow.
13. Two dairymen refused to have their stock examined by a veterinarian. Their milk was not afterward allowed to enter the city.
14. Farmer reports one cow in a bad physical condition.
15. Cow with a sore on one teat; producer claimed this milk was not being sent to this city. Two cows with congested udders.
16. Gargety cow. Another cow which had recently calved.
17. Dirty barn; cows caked with dried manure. One cow with a swollen udder. Producer had not complied with requests made at the last inspection by the contractor.
18. Two cows with inflamed udders, one giving bloody milk. Cows subjected to the tuberculin test and some which denoted a positive reaction killed.

19. Gargety cow.
20. One cow nearly dry; another fresh from calf.
21. Cow in poor physical condition.
22. "Rheumatic cow."
23. Gargety cow; general surroundings of this dairy such that none of the milk was allowed to come to this city.
24. Cow with a swollen udder.
25. Cow in poor physical condition since calving. The existing state of affairs, due to retention of after-birth and the attendant discharge, some of which found its way into the milk pail, was disgusting and apparent to observation.
26. Gargety cow.
27. One cow with a high fever. One cow giving milk from one teat by means of a milk tube.
28. Cow recently calved; another cow about to calve.
29. Gargety cow with swollen udder.
30. Cow with a section of the udder atrophied and discharging pus.
31. Cow with a blind abscess.
32. Cow with one teat obstructed; milk contains much pus.
33. Cow with a large abscess on udder.
34. Cow had a sliver in one teat; milk from the other quarters was being sent to market.
35. Cow recently calved.
36. Two cows nearly dry.
37. Cow with one quarter of udder badly swollen. Producer claimed that this milk was not being used; undoubtedly some of it was in the mixed supply.
38. Cow fresh from calf.
39. Two gargety cows.
40. Drying off two cows.
41. Cow with several sores on teats.
42. Five cows being dried off.
43. Cow with one-quarter of bag caked and swollen.
44. Drying up three cows.

45. Cow with garget.
46. Cow recently calved.
47. Cow with sore teats; probably the stripping was not thorough.
48. Two cows approaching the calving period.
49. Cow with sore teat.
50. Sick cow. Farmer told the milk dealer he knew the milk was "not right."
51. Cow approaching the calving period.
52. Cow with garget; giving only two quarts of milk per day and soon to calve.
53. Gargety cow.
54. Cow injured some time ago, and giving milk from only three teats.
55. Cow nearing the calving period.
56. Cow in poor physical condition.
57. Cow with two hind quarters of udder congested.
58. Cow recently calved.
59. Producer kept out of market supply only four milkings after calving. At this farm there were nineteen cows fresh from calf, and the milk from these animals was being sent to Boston.
60. Three cows approaching the calving period.
61. Cow in heat.
62. One cow in poor condition; has a cough and is much emaciated; subsequently this cow was found to be tuberculous and was killed. The barn was dirty and poorly lighted.
63. Three cows recently calved.
64. Cow nearly dry.
65. Drying off three cows; they were being milked only once a day.
66. One cow had occasionally given bloody milk, and it was thought that some of this milk became mixed with the supply sent to market. By an examination of the remaining cows in this herd it was found that

two of the animals had swollen throat glands; another had a bunch upon the udder, and the respiration of four cows was abnormal. The product of five cows was ordered excluded from the milk sent to market.

67. One cow nearly dry. Other cows being fattened and giving only two to three quarts of milk daily.
68. Cow reported as gargety. It was subsequently ascertained that this cow was a poor milker, "not giving milk freely." To obviate the difficulty, a spring lance was inserted in the cow's teats. The lance was then opened and drawn through the teat for the purpose of removing any obstruction. After this operation blood flowed from the teats for several days. Later the milk was supplied to consumers, and an examination disclosed its abnormality.
69. Gargety cow.
70. Cow with inflamed udder.
71. Two cows nearly dry.
72. One cow with a swollen udder and with respiration slightly above normal.
73. One cow with a weak quarter; another cow was found to have a "fallen hip."
74. Gargety cow.
75. Cow with caked udder.
76. The milk from seven cows about to calve was being sent to market.
77. One cow with a "puff boil" and swollen udder.

In a more recent instance, where abundance of pus had been discovered in the milk from a dairy of one hundred cows, nearly thirty animals were found with indurated udders, and one cow had an abscess upon one teat from which a purulent and offensive discharge was obtained. It is true that in this instance the product from this quarter of the udder was not being sold; but as the trouble was not localized, the milk from the other quarters, which was being mixed

with the product from this dairy, was heavily charged with pus. After the discovery of the facts, and under orders from the authorities, the cow was removed from the herd, a step which should have been taken when her condition first became known to those in charge of the stable.

In other recent investigations following the discovery of abnormal milk, nine cows in a herd of forty were found to have garget; one cow in a herd of nine was affected with garget; and one cow in a herd of six had the same trouble. These occurrences may be further duplicated, and in instances where producers were well aware of the presence of diseased animals in their herds.

The following conclusions are offered:

1. Dairymen do not exercise sufficient care in observing the condition of their stock, and do not exclude from the milk offered to the public the product of unhealthy cows, and of cows just prior to or subsequent to the calving period.

2. Apparent abnormality in cows, such as certain forms of udder trouble, afford ample warning to observant dairymen that the milk is likely to be unwholesome, and that in all fairness to purchasers and consumers it should not be offered for sale. It is nothing short of criminal for producers to permit the milk from diseased animals to be used by the public. Both decency and law demand the fullest protection for consumers.

3. While present methods afford a means of detecting this objectionable milk, producers should not await the result of such examinations, but should take the initiative in withholding milk from all suspected animals.

4. It is to the advantage of the producer to render all possible assistance, even if it entails a temporary pecuniary loss from throwing away a small amount of milk. In the end it means a greater market for his product, for public confidence in a milk supply insures a demand for increased quantities of this fluid.

5. Until the producer is willing to give the consumer the protection which is his due, the method outlined in this paper affords an effective means for materially reducing the amount of abnormal milk.

THE SURVIVAL OF B. TYPHOSUS IN MILK WHEN USED IN ORDINARY BREAKFAST-TABLE COFFEE AND TEA*

By H. W. HILL, M.D.
Minnesota State Board of Health Laboratories.

In typhoid epidemiological work, where milk is suspected as the transmission agent, it is not infrequent to encounter in the list of those sick certain ones who deny using the suspected milk, except in tea or coffee. The laity generally assume that the mixing of milk with hot coffee or tea for use at the table kills the infective bacteria. It has long been known (Sternberg) that the typhoid bacillus may be destroyed in water or broth at 60° C. in two minutes. Recently Rosenau, retesting the thermal death point of *B. typhosus* in milk, found 60° C. for two minutes ample. In view of these facts, further investigation seemed desirable. The experiments made seem to show:

(*a*) That *B. typhosus* survived in the mixture and could be recovered from it twenty-four hours after the mixture was first made, except when the initial temperature of the mixture was above 68°.

Coffee or tea cannot be used as a drink by most people at a temperature above 50° C.; hence, to secure a good, drinkable beverage does not require that the coffee-milk mixture be initially at or above 80° C.; and in practice, at the ordinary family table, it is unlikely that any but the

* Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

first two or three cups poured will show this temperature; the second and third cup furnished to any individual will almost certainly be well below 80° C.

The epidemiologist, therefore, in listing those exposed to infection from a given milk supply, should not eliminate those who drink milk only in coffee or tea. Of course, the absolute amount taken by such persons is less than by those who drink straight milk; but the milk taken cannot be considered as sterilized by the coffee or tea. The experiments made go to show that neither temperatures below 68° C., nor any inherent antiseptic virtues that the coffee or tea extracts might be supposed to possess. can be trusted to kill the typhoid bacillus. The discrepancy between the temperatures found as sufficient by Rosenau and those we found necessary in practice does not necessarily involve a contradiction. The discrepancy due simply to the fact that the accurate and exhaustive methods employed by Rosenau are not likely to be reproduced on the family breakfast table; the chilling of the outer layer of coffee-milk mixture meeting the cold china cup, the large surface of the mixture exposed to the air, the possible protection afforded to typhoid bacilli concealed within the center of milk particles coagulated by the combination of coffee extract and heat, possibly the washing up on the comparatively cool sides of the cup of a few bacteria which there escape the full heat, and later are washed back, after the mixture has cooled, will account for the results in practice.

The important point is that in advising the sterilization of milk during typhoid epidemics, a temperature which the skill and care of a laboratory test shows sufficient should have a large margin of safety added to secure the ends sought in practice, when the instructions given are to be followed by a miscellaneous assortment of domestics, ignorant mothers or even fairly intelligent people. In epidemics, boil the milk is the only safeguard, and even so simple a statement as that is not wholly satisfactory. I was asked

by a professor in a very successful business college, a bright, well-educated man, "When you say *boil*, do you mean until bubbles form, or just until it begins to steam?" Of course I told him that liquids often steamed at the freezing point; steaming is a mere question of the humidity of the atmosphere.

Carefully conducted pasteurizing by competent and careful people undoubtedly gets rid of any infection present in the milk; but I have found in one case a boy capping bottles by hand after the pasteurizing; he had a sister down with typhoid at the time, and he himself came down a little later. Although no cases have yet been traced directly to him, owing to a widespread outbreak existing at the time, it was difficult to attribute any given case to its exact source, yet the chance unquestionably existed. A very few typhoid organisms introduced into pasteurized milk would tend to multiply very much more rapidly than in raw milk and create a very dangerous menace.

On account of the danger of infecting milk in a widespread outbreak through the hands of milkers and milk handlers, I think it well to order all milk boiled, even if first pasteurized, during such an outbreak.

THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

JANUARY QUARTERLY MEETING

Boston, Mass.

The annual meeting of the Massachusetts Association of Boards of Health was held at the Brunswick Hotel, Boylston Street, Boston, on Thursday, January 28, 1909, under the presidency of Dr. Henry P. Walcott.

The records of the last meeting were read and approved.

The following were elected to membership in the Association:

Dr. Mark W. Richardson, Secretary State Board of Health.

Dr. Ernest B. Emerson, Superintendent Massachusetts Hospital for Consumptives, North Reading, Mass.

Thomas Plimpton of the Walpole Board of Health.

Melzar W. Allen, Chairman of the Walpole Board of Health.

Dr. William H. Allen, Chairman of the Mansfield Board of Health.

Dr. Frederick H. Fuller, of the Walpole Board of Health.

Dr. Thomas J. Robinson, Chairman of the Taunton Board of Health.

Dr. Edward J. Galligan, of the Taunton Board of Health.

Dr. Frank E. Tilden, of the Easton Board of Health.

Dr. E. F. W. Bartol, of the Milton Board of Health.

Dr. Ernest H. Sparrow, Milk Inspector, Cambridge.

Dr. William O. Hewitt, of the Attleboro Board of Health.

Dr. G. Forrest Martin, of the Lowell Board of Health.

Dennis J. Murphy, of the Lowell Board of Health.

Charles H. Bossler, of Lawrence.

Dr. Peter D. McKellegat, of Lawrence.

The following report of the Treasurer was read and accepted.

ANNUAL REPORT OF THE TREASURER FOR 1908

Receipts

Balance from 1907	$1,531.71
Annual dues for 1907	18.00
" " " 1908	481.00
" " " 1909	4.00
Interest one year Central Savings Bank, Lowell	50.98
Total	$2,085.69

Expenses

Printing	$26.17
Postage	47.80
Cigars and dinners for guests	36.48
Clerical assistance	20.75
Treasurer's bond	4.00
Stenographic report of meetings	58.20
Publishing Journal	359.31
Committee on Sex Hygiene	68.61
Total expenses	$621.32
Balance to 1909	1,464.37
Total	$2,085.69

Of the above balance, $1,313.49 is drawing interest in a savings bank.

Respectfully submitted,

JAMES B. FIELD, *Treasurer.*

Examined and approved as correctly cast and properly vouched for.

J. ARTHUR GAGE,
Auditor.

January 25, 1909.

The following officers were unanimously elected:

For President, H. P. Walcott, M.D.

For First Vice-President, S. H Durgin, M.D.

For Second Vice-President, C. V. Chapin, M.D.

For Secretary, James C. Coffey.

For Treasurer, James B. Field, M.D.

For Executive Committee (for two years): J. P. Schneider, M.D. of Palmer; E. L. Fiske, M.D., of Fitchburg; C. H. Eidam, M.D., of Lawrence; F. A. Woods, M.D., of Holyoke; George W. Smith, M.D., of Lawrence, and M. V. Pierce, M.D., of Milton.

THE PRESIDENT. Dr. Frothingham has kindly come here this afternoon to make some remarks upon a very important subject.

DR. FROTHINGHAM. Gentlemen, I have been asked to say a few words regarding rabies, which disease is so prevalent in Massachusetts at the present time. There is no disease which is so simple to control, which is so easy to absolutely eradicate, as rabies. The way to eradicate it is to stop your dogs from biting, and the way to prevent your dogs from biting is to muzzle them, to put on a proper, well-fitting, comfortable muzzle, that allows the dog plenty of room to move his mouth, to get out his tongue, and at the same time prevents him from biting.

I want to read you the statistics from England, the result of their enforced muzzling, and I wish the members would take a piece of paper and write down these figures, and later you can look them over and see if they are not exceedingly convincing. In the year 1887 there were 217 cases of rabies among dogs in England. In 1888 there were 160 cases, always among dogs, and no muzzling was in force. In 1889 there were 312 cases. At this time an enforced muzzling law became operative, and all the dogs were muzzled. The next year, 1890, there were 129 cases. In 1891 there were 79 cases. The muzzling law was still on. In 1892 there were 38 cases. Then the muzzling order was rescinded, the muzzles were removed, owing to certain people who objected

very much to having the trouble of muzzling their dogs. It was not the dogs' fault; it was the fault of the owners of the dogs. The next year, 1893, the number of cases went up to 93. In 1894 it rose to 248. In 1895 it rose to 672, about what we have had every year in Massachusetts for the last five years. Muzzling was now enforced once more, with the result that in 1896 the number fell to 438, in 1897 to 151, in 1898 to 17, in 1899 to 9. In 1900 there were no cases in England and Scotland and there has never been a case of rabies there since that date. The muzzling order remained on for a number of years, until they were absolutely sure that no rabies existed in England. It was then removed, and I was told last summer that the first case of rabies that appeared anywhere in the British Isles muzzling would be enforced again immediately. In the meantime they have a six months' quarantine, and no dog is allowed to land in England unless quarantined for six months. It seems to me that those figures are exceedingly convincing, and if you will look those over at your leisure I think you will agree with me. In Australia they never have had any rabies, probably owing to the fact that they have always had this six months' quarantine law.

In dogs alone last year we had 500 cases. If other animals are added to that, I think the number went over 600. I am not quite sure of the figures. There were, I think, only six cases of death in human beings last year from the disease. The year before, I think there were eight. But remember that during this time a great many people have taken the preventive treatment. Last year about 140 took the treatment and the year before about 158.

I would like to make a motion, to this effect: to instruct our Committee on Legislation to appear before the State House legislative committee and favor the proposed amendment pertaining to the dog muzzling laws. I thoroughly approve of a year's muzzling law for the entire State, and if at the end of that time we have not succeeded in materially

reducing the amount of rabies in the State, then the question can be brought up again. But I advocate, as Dr. Durgin has already for the city of Boston, a strict muzzling law for at least a year, to apply to all the dogs in Massachusetts. The present laws in this State are so worded that it is impossible to enforce them. To make them of any force or value, we must amend them. That is the object of this motion.

DR. DURGIN. The amount of notification now required is so cumbersome that it is practically useless to attempt to enforce an order of the mayor and aldermen, or of the selectmen of the towns to muzzle dogs, and it is to get rid of that superfluous and obstructive condition in the law that this amendment is offered.

THE PRESIDENT. But we still want something better. We still want to get the protection which England has.

DR. ROSE. England has sea all around it to keep rabid dogs out.

THE PRESIDENT. Of course we cannot get the same protection, but we can get a measurable protection; something infinitely better than what we have, I hope.

DR. FROTHINGHAM. That is an argument, of course, which is constantly being brought up; but supposing all the dogs in Massachusetts are securely muzzled and a rabid dog from a neighboring State comes into Massachusetts and bites ten or twenty of our dogs; our dogs being muzzled the disease cannot spread, it cannot go on; we have reduced it to a minimum. If Massachusetts takes a step in this direction, and is the first State to insist upon muzzling, the other States will soon follow. Our Federal Government is already very much stirred up about this matter, and has issued special notices regarding rabies, and it very likely will come to our assistance.

MR. NEWCOMB. In the opinion of Dr. Frothingham, what is the effect of the very lax enforcement of the dog license law in this Commonwealth as a factor in this matter? In other words, if you go after the unlicensed dogs and reduce them, you reduce the percentage of danger, and those who pay for their dogs have a little more satisfaction in their side of the case. I thoroughly indorse the idea of protecting human life; but knowing what I do about this laxity I cannot help speaking.

DR. FROTHINGHAM. It is a very sad thing that our licensing laws are not enforced, but that it seems to me cannot be greatly improved without considerable trouble. If we can get a muzzling law that will, in itself, improve the licensing problem, because then every dog that has not a muzzle will be destroyed, and consequently, any one who has a dog and who values it will put a muzzle on it and very likely pay his license also.

DR. NEWCOMB. I consider that an assumption and not a fact. It has not been proved. A man who pays for his dog license does not like that altogether, you know.

DR. FROTHINGHAM. Of course if we could have that licensing law thoroughly enforced it would be a great help; but it would not prevent a great many of our dogs, which are properly licensed and which live in our houses, from suddenly taking it into their heads to run off fifty miles biting a lot of other dogs. The owner is often more at fault than the dog.

By vote of the Association the following committee was appointed by the chair, the committee being given full power to take such action as might be necessary in the premises:

Mr. James C. Coffey, Worcester.

Dr. S. H. Durgin, Boston.

Dr. Langdon Frothingham, Boston.

MR. COFFEY. Mr. Chairman, there is a bill before the Massachusetts Legislature known as House Bill 690. The matter came before the Executive Committee today, and it seemed to be of such interest and of such a character that the Executive Committee thought it ought to be brought before the membership here today for action. It is "An Act Relative to Appeals from Decisions of Boards of Health of Cities and Towns." I will read the first two sections of the bill:

"SECTION 1. In all cases where boards of health of cities or towns deny petitioners a permit, license or privilege to do the thing petitioned for, having jurisdiction therein, the reasons for such denial shall be stated; and in cases where the use of property in the manner and form proposed by any petitioner is deemed dangerous to the public health, it shall be so stated among the reasons given for the refusal to grant the request of the petitioner.

"SECTION 2. In all cases where a petitioner is aggrieved by the action of a board of health, as provided in the preceding section, he shall be entitled to appeal therefrom, and have a trial by jury in the superior court in and for the county in which such petition is filed; and the verdict shall determine the right of the petitioner in the use or enjoyment of his property as set forth in his petition; such appeal shall be taken within thirty days after notice of the decision of such board has been duly served on the petitioner, by filing with such board a written notice of his claim of appeal, and the record in the case shall forthwith be transmitted to the clerk of the superior court in and for the county in which such causes arises."

If any of you who have had any experience with health work will give the matter a moment's thought you will realize how difficult it would be to carry on the work properly if we were obliged to give a reason for every act that we perform; for instance, boards of health are empowered by law to license undertakers, in some cases to license milkmen, to license scavengers. They may, for reasons which they deem sufficient, learn by investigation that the man is not a suitable person; that he is not of such a character as would warrant his being given the license for which he asks, and yet it would be difficult to prove that thing. The evidence is sufficient to satisfy the board that that man is not of such a character as would entitle him to a license and yet, under this bill, you must state the reason why you refuse. In lots of

ways the bill is pernicious and would interfere with the workings of the board. It gives them a right to appeal for a jury and delay action on some important matter.

The animus of this bill I know, because I have been concerned in the matter in Worcester. It has been started in Worcester, and put in for some action that was taken by the Board of Health in Worcester; and it was made broad enough to cover the entire State. I think that it ought to be opposed by this organization, and I move that a special committee be appointed by the chair for the purpose of approving the legislation in relation to rabies in dogs be empowered to appear before the proper committee and oppose this bill.

DR. E. H. TROWBRIDGE. I would have been very much pleased if Mr. Coffey had made a little more explicit statement or explanation of this bill. This bill is far reaching, and it is very deceptive, it is deceptive in this way, that the obstacle and the very hard task which the Board of Health of Worcester had to settle was really a petition from a person who, after not complying with the laws of the State and defying the laws of the State, then asked the Board of Health of Worcester to legalize what he had performed illegally. The illegal act which he had performed was to erect a stable within a very few feet of a three-tenement block, which would be entirely permeated by the air of that stable when the wind was blowing westerly and the windows of that three-tenement apartment were open in the summer time. This bill, while it has no mention of any such circumstances as that, certainly is a very deceptive bill and a very far-reaching one.

The motion to appoint a committee to oppose House Bill No. 690 was carried, and the following committee was appointed by the chair:

Dr. Chase, Dr. Palmer, Mr. Winslow.

DR. PALMER. I desire to present the

Report of the Committee on Sex Hygiene.

Originally appointed at the meeting one year ago, this committee was organized and began its active work in April, submitting to the April meeting a report of recommendations, which it was your pleasure to accept.

The committee has recommended to the State Board of Health that syphilis and gonorrhœa be included in the list of diseases dangerous to the public health. It has requested that the State Board of Health issue to the local boards of health, for distribution by physicians and hospital superintendents, educational leaflets, or cards, similar to Circulars 1 and 2 prepared by the committee. The State Board of Registration in medicine has been asked to include prevention and cure of syphilis and gonorrhœa among the subjects of its examinations. School authorities have been urged to include judicious instruction on sex hygiene. Ten thousand copies of Circular No. 1 and 7,000 of Circular No. 2 have been printed, and a large number of these have been distributed in the city of Boston and throughout the State. A considerable number have been sent to individuals throughout the country on request, these being paid for at cost where more than a half dozen were requested. In this way about 4,000 have been sent outside of the State. Both of these circulars have been received with marked favor, and have been adopted for distribution by the Maryland Society of Social Hygiene and by the Virginia Society.

The total expenses of the committee have been $89.61. Subtracting receipts from contributions and sales, the net cost to the Association has been $75.86. The committee has not yet been able to accomplish its recommendations, but feels encouragement in the increased public interest which is taken in the matter all over the country, and desires to develop its work. Members of trade unions, church organizations, teachers' organizations, women's clubs,

public dispensaries, as well as many private physicians and individuals, have requested and received copies of the circulars, and will, to an increasing extent, use them. Six colleges, several trade unions, business men and commercial bodies and manufacturers are among those who have indicated an interest by asking for copies and stating their approval of them. The State Board of Health of the State of New York has requested permission to make abstracts or reprints of them. The Massachusetts State Conference of Charities and Correction has been induced to appoint a committee for the discussion of this subject at its next meeting. Several members of your committee have been asked to serve on the Conference Committee, of which Dr. Charles W. Eliot has accepted the chairmanship.

The Director of the Department of Zoölogy of Syracuse University, in a letter dated December 4, states that he is glad to express unqualified approval of the circulars. He has also obtained very favorable opinions from his colleagues. Dr. George W. Gay, Ex-President of the Massachusetts Medical Society, states that he is glad to see that the matter has been taken up by our Association, and he feels that good results should be the outcome of its efforts.

President G. Stanley Hall of Clark University writes an encouraging and approving letter.

The committee feels that there is a continuous need for its work, and respectfully requests that if this report is approved, its life and the appropriation which was placed at its disposal by the Association be continued through the coming year.

It was voted that the report be accepted as a report of progress, and that its recommendations be adopted.

THE WORK OF THE STATE INSPECTORS OF HEALTH AND ITS RELATION TO THE WORK OF LOCAL BOARDS OF HEALTH

By DR. ELLIOTT WASHBURN
State Health Inspector, Taunton, Mass.

The legislative enactment of 1907 which created State Inspectors of Health in Massachusetts, definitely defined certain duties for those inspectors to perform and further directed that they shall be under the general supervision of the State Board of Health, and shall perform such duties other than those specifically mentioned as that Board from time to time shall determine. The exact words of Sections 3 and 4 of that enactment are as follows:

"SECTION 3. Every State Inspector of Health shall inform himself respecting the sanitary condition of his district and concerning all influences dangerous to the public health or threatening to affect the same; he shall gather all information possible concerning the prevalence of tuberculosis and other diseases dangerous to the public health within his district; shall disseminate knowledge as to the best methods of preventing the spread of such diseases, and shall take such steps as, after consultation with the State Board of Health and the local health authorities, shall be deemed advisable for their eradication; he shall inform himself concerning the health of all minors employed in factories within his district and, whenever he may deem it advisable or necessary, he shall call the ill health or physical unfitness of any minor to the attention of his or her parents or employers and of the State Board of Health.

"SECTION 4. The State Inspectors of Health shall be under the general supervision of the State Board of Health and shall perform such duties other than those hereby imposed upon them as the said Board, from time to time, shall determine. They shall keep a record of their proceedings and observations, shall annually make a report of the same to said board on or before the thirty-first day of October, shall from time to time furnish said board with such information

as it may require touching circumstances affecting the public health in their respective districts, and shall in every instance where written suggestions are made by them to the local authorities send copies of such suggestions to said board."

Section 5 of the same Act places upon the State Inspectors of Health the enforcement of the provisions of laws relating to the light, ventilation and cleanliness of factories and workshops; to the provision of pure drinking water in such places of employment, and of suitable seats for women employees therein; to suitable water-closets in factories and workshops; to manufacture of clothing in tenements and dwelling-houses; to installing hoods, suction pipes and blowers in places where emery wheels are used for dry grinding; to the prevention of undue amounts of dust in any trade carried on in factories or workshops; to the maintenance of proper or suitable wash-rooms and water-closets in foundries; to certain defective sanitary arrangements and nuisances in factories; to the employment of minors in places where acids are made; and to the ventilation of schoolhouses and public buildings.

The Legislature of 1908 placed upon the State Inspectors of Health the enforcement of a law relative to humidifying in factories, and by other legislation gave to these officers equal jurisdiction with local health authorities in the matters pertaining to the sanitary conditions in slaughter houses.

The work of the State Inspectors of Health then may be briefly summarized under the following headings; he shall inform himself concerning:

(1.) The sanitary condition of his district, and all influences therein dangerous to the public health.

(2.) The prevalence of tuberculosis and other diseases dangerous to the public health in his district; and he shall disseminate knowledge as to the best methods of preventing the spread of such diseases.

(3.) The health of all minors employed in factories in his district.

(4.) The sanitation of factories and workshops, tenement houses and dwellings in which clothing is made for sale, schoolhouses and public buildings, and slaughter houses.
(5.) Certain facts relative to drainage, sewerage and water supply.
(6.) He shall also perform such other duties as the State Board of Health from time to time shall determine.

It will be seen at once that a large part of the work of the State Inspectors of Health is in extremely close relation with the work of the local Boards of Health. There is, however, this distinction: that the work of the inspectors is mainly advisory; except in the enforcement of certain laws under the heading No. 4, it is his duty to investigate and to advise. In a sense he acts as an intermediary between the State Board of Health and the local boards of health; one to whom the local board may turn for consultation and assistance; one who may give to a board asking for relief in a difficulty the benefit of experience derived from the study of the relief of a similar difficulty by some other board in his district; for it is a fact that, with the exception of the meetings of this Association, boards of health rarely confer together and one board seldom knows how another board is carrying on its work or meeting its emergencies.

There are many things in the work of the local boards of health and the State Inspectors of Health which are common to both; often the local board is perplexed as to its exact duty, and although the perplexity is very real to the board, yet it hesitates to carry the matter to the State Board of Health for advice or assistance. Now, it seems to me that this is one of the very purposes for which State Inspectors of Health were created; that it is one of the things that they are *paid to do*, to aid local boards in such perplexity. Especially does this seem true when we remember that the membership of local boards is constantly changing, most

boards changing one-third of its membership every year, while often two-thirds, or even the entire membership is changed, and so the work and duties of a local board are unfamiliar to at least one-third of its members for the first half, or longer, of every year; for there are peculiarities of public health matters which cannot be learned in a day nor a week.

Gentlemen of local boards of health, the State Inspectors of Health were not brought into being to *supplant* boards of health, but to *assist* them. It was intended that you should call upon them for assistance, and it is their duty to *render* that assistance, by themselves, if possible; but if not possible by themselves, then through the greater advisory power which stands behind them, and which is *always* at your disposal, that of the State Board of Health of Massachusetts.

Taking up in order the duties of the State Inspectors of Health, under the headings which we have made, let us consider:

(1.) The sanitary condition of the district, and all influences therein, dangerous to the public health.

The oversight and abatement of ordinary nuisances are vested in the local boards of health; such nuisances, however, are often brought to the attention of the State Inspectors of Health in one way or another, often by letters of complainants to the State Board of Health. State Inspectors of Health have absolutely no power to order the abatement of such nuisances, but may call them to the attention of the local boards, and recommend such measures to those boards as seem proper. Occasionally a local board, more especially in a small town, has hesitated to act in abating a nuisance through fear or dread of offending a neighbor or influential citizen. Recommendations from the State Inspectors of Health in such cases give these boards an added reason for acting. In common parlance, the local board of health uses the State Inspector of Health as a club, to which that

latter official does not in the least object, as he is usually some miles away—provided that the end sought, the abatement of the nuisance, is brought about.

(2.) Diseases dangerous to the public health and the dissemination of knowledge to prevent the spread of such diseases.

As you know, the State Board of Health was asked by the Legislature of 1907 to specify what diseases are dangerous to the public health within the meaning of that statute which says that physicians and others are to report to the local boards of health all cases of smallpox, diphtheria, and other diseases " dangerous to the public health " which come within their knowledge. Acting under the authority thus bestowed the State Board of Health made out a list of diseases which it deemed to be dangerous to public health, and reportable under the said law.

It is the duty of the State Inspectors of Health to ascertain the extent and prevalence of such diseases in the districts in every way that they can; to see that all cases of such diseases are properly reported to the boards of health, and if not so reported, to take proper action against the person who, having knowledge of the existence of such disease, fails to report it to the proper authority. If any board of health hesitates, for any reason, to take such action against an offender, let it be remembered that the State Inspectors of Health are expected to do this work. It is a most regrettable fact that there are in the profession to which your reader belongs, certain physicians who *do* not and *will* not report their cases of these diseases dangerous to the public health until they are absolutely compelled to by public criticism, or the fear of the death of their patient; and let it also be remembered that when the State Board of Health submitted the list of reportable diseases it placed no emphasis upon any particular disease; *all* in the list must be reported according to the law.

It is the duty of the inspectors to see that persons ill with such diseases are not neglected or improperly cared for by reason of negligence of the local authorities; to see that the State Board of Health and the local boards are notified of the existence of such diseases wherever found by the State Inspectors of Health, whether in a minor working in a factory, or in a member of a family living in a tenement house workshop where clothing is made, or which may come to their knowledge in any way whatsoever.

It is the further duty of the State Inspectors of Health to disseminate knowledge as to the best method of preventing the spread of such diseases, and to aid and assist the local boards in the enforcement of quarantine, and to take such steps as, after consultation with the State Board of Health and local health authorities, shall be deemed necessary for the protection of the public.

It is in the prevention of the spread of diseases dangerous to the public health that the relations between the local boards of health and the State Inspectors of Health are the closest. Working in harmony most excellent results may be obtained; working in discord little will be accomplished on either side; although an active local board undoubtedly will accomplish more without the aid of the State Inspector than that officer may hope to accomplish without the coöperation of the local board.

(3 and 4.) The health of all minors employed in factories, the sanitation of factories and workshops, tenement houses where clothing is made, schoolhouses and public buildings, and of slaughter houses.

The duties imposed under these headings form the greater part of the duties of the State Inspectors of Health, although these duties do not bring him in to very close contact with the local boards with these exceptions: (a) cases of dangerous diseases in factory minors, or in tenement house clothing workers, as stated elsewhere in this paper; (b) nuisances

found in factories which are not under the special laws governing factory conditions, but which come properly under the head of ordinary nuisances, and as such are under the direct supervision of the local board of health; (c) the sanitary conditions in slaughter houses over which the Legislature of 1908 gave to the State Inspectors of Health equal powers with the local boards of health.

An idea of the amount of work necessary in the examination into the health of minors and the sanitary conditions of factories may be obtained from the statement that your reader examined, during the year ending Oct. 31, 1908, the sanitary conditions of 342 factories of 63 different industries, employing 31,648 hands, of whom 3,833 were minors. This examination was made in a year of considerable industrial depression, and the inspector expects to find at least 50,000 employees, of whom 6,000, doubtless, will be minors, in his second examination of the same factories.

(5.) Certain facts relating to water supply, drainage and sewerage.

While State Inspectors of Health are not expected to advise concerning questions of water supply, drainage or sewerage, they may urge that the State Board of Health be consulted in such matters, if it seems necessary, and may point out to local boards of health, or to special committees of towns appointed to consider such matters that the assistance of the State Board of Health is obtainable. The special duty of the State Inspector of Health, under this heading, is to call attention to noxious or objectionable conditions, urge their improvement, and inform local authorities as to the work of the State Board of Health in such matters.

In order to confine this paper to the time alloted to it, it has been necessary to cite generalities rather than to give a detailed account of the work, but enough has been said to show that the duties of the State Inspectors are wide and varied, and that the relation between the work of the local boards of health and the State Inspectors of Health is, in

all their work, close and in certain parts of their work is very close.

It is hoped that the following points have been made clear:

(1.) The duties of the State Inspectors of Health are largely advisory.

(2.) The work of the local boards of health and of the State Inspectors of Health are especially closely related in the prevention of the spread of preventable diseases.

(3.) Coöperation between these two forces of public health officials is indispensable.

(4.) It is the *duty* of the State Inspector of Health to assist the local health authorities, and they should not hesitate to ask for such assistance.

(5.) Conferences, at frequent intervals, between local boards of health and State Inspectors of Health are highly desirable.

Gentlemen, in behalf of the State Inspectors of Health, I ask you to become acquainted with the Inspector for your own particular district.

We know that you can assist us and we believe that we can assist you.

PROFESSOR WINSLOW. I should like to offer a word of testimony, from what has come to my own notice during the year, about the work of the State Inspectors of Health. It happened that last summer an investigation of my own carried me into a good many factories in the State. Everywhere I went I found improvement in a very large proportion of the factories; I think in all the towns to which I went I found that old factories were being remodelled, bad ones were being improved, and good ones were being made even better. It astonished me to find how far-reaching and extensive the work of this body of men has been even during the first year. There is one point on which I hope very much that the inspectors may be able to extend their work in the future, and that is in the line of getting analytical data in regard to the condition of the air in the factories. Ultimately, of course, a proper system of factory inspection ought to rest on some standards as to the temperature and humidity, and carbon dioxide, and possibly, eventually, on quantitative standards as to the amount of dust permissible in different industries. Members of the Association may, many of them, be familiar with the splendid work that has been done in England by the inspectors of factories along this line in the last two or three years; first, in the accumulation of data as to existing conditions; and then in the formulation of definite standards. Something of that kind, I hope very much, may be taken up at some time here. The whole business of factory inspection in this country is at its beginning; and all over the country those who are interested are looking to the Massachusetts State Inspectors of Health for leadership in this line. There is a magnificent opportunity. Of course I realize how much there is to do, and particularly how much there is to do in connection with the broader aspects of the work, in the coördination of all the sanitary energies of the State into one vital and efficient organism; but as the work progresses, and as the more important and pressing things are done, I hope very much

that the inspectors may be able to give attention to the investigative side of the problem as well.

DR. DURGIN. I hope that the relation between the local boards of health and the State inspectors has been, as pleasing and beneficial in the other cities and towns of the Commonwealth as it has been in Boston. I hope Dr. Linenthal, whom Boston is favored with, is here, and that we may hear something from him.

DR. LINENTHAL. Mr. Chairman, the work in this district differs somewhat from the work of the other State Inspectors of Health. I have a great number of tenement workrooms to inspect. During the year I visited somewhere in the neighborhood of 3,000 such workrooms, and investigated the conditions under which clothing is made in them. These rooms, as you know, have to be licensed in order that work on wearing apparel may be carried on in them. I was very pleased to hear Professor Winslow's suggestions. I have been talking this very matter over during the dinner with one of the other State Inspectors, and I hope that we shall be able to carry on some investigations along the lines he suggested.

THE PRACTICE OF EXPOSING FOOD STUFFS TO THE STREET DUST AND ITS EFFECT UPON THE PUBLIC HEALTH

By **FRANCIS H. SLACK**
Director of the Boston Board of Health Laboratory

It is an indication of the progressive spirit of our times that agitation of any question relating to the public health receives sympathetic hearing, the people, as a whole, appreciating the value of sanitary precautions in promoting the welfare of the whole community as well as in the protection of the individual citizen. Such scourges as devastated cities and countries a few generations ago are impossible where modern sanitary regulations are enforced, but we are still subject to numerous smaller epidemics and individual cases of infectious disease, and our efforts are now directed toward bringing into control the many comparatively small unhygienic habits and customs in which we are still at fault.

Among the most important measures of preventive medicine in any community are those enforced regulations assuring it of the purity of its water and food supplies, nor can we be too careful in protecting these from possible contamination or adulteration.

Among other questions along these lines that of the propriety of exposing meats, provisions, fruits, candies, etc., which are being offered for sale outside of markets and stores, has recently received considerable attention, and regulations have been passed by the health boards of some of our cities (Brockton and Haverhill) prohibiting such exposure, es-

pecially of cooked foods and of such articles as are commonly eaten without preliminary cleansing or cooking.

A few months ago the writer was requested by Dr. Durgin, Chairman of the Boston Board of Health, to investigate this subject from a bacteriological standpoint, especially with relation to the effect of the exposure of such food stuffs upon the health of the community, with a view of discussing the question as to whether this practice was simply an unclean one, or whether it might, also, be considered actually dangerous, through the harboring by such provisions of disease organisms borne to them by dust or flies.

Prevalence of the practice in Boston. In Boston the practice of thus exposing foods is a common one, especially in the market district, some stores making a great percentage of their sales from the sidewalks. Meats are not only exposed in this way, where for purposes of drawing trade there might seem to be some excuse, but often there is but slight attempt to protect them during transportation, wagon loads of dressed meats being driven from place to place with but partial burlap covering, exposed not only to clouds of street dust and flies, but to splashing mud from wheels. In the residential sections of the city food supplies are more commonly kept inside, though even here one frequently sees boxes of vegetables tilted against the outside of the buildings near the doors, while inside, uncovered provisions are often almost equally exposed in summer because of open doors and windows.

Fruit stores, almost without exception, have open-air displays, and during the summer fruits and vegetables are peddled from hundreds of open wagons and push carts.

Candies, as a rule, are protected in glass-covered cases, but there are a few open-air displays of candies in some of the busier sections of the city, and uncovered candies are not uncommon within the stores.

Value of Bacteriological Tests. In considering the problem of making tests to ascertain if such exposure of provisions

is dangerous to public health, one must be exceedingly careful, since thousands of tests along certain lines which might suggest themselves would but result in waste of time and the piling up of negative evidence. The organisms of the infectious deseases, as a rule, carry on but a precarious existence when outside their human host, and it may safely be said that the majority of infections are by direct contact with one who has the disease, with something he has recently touched, or by infection of some medium which prolongs the life of the bacteria by furnishing them with food or moisture. Tubercle bacilli because of their resistence to long drying and the frequency with which they are scattered in sputum, are a serious menace to health; but even with these it is probable that most infections are by direct contact.

Even in epidemics traced to a common cause it is most difficult to find the infective agent in the medium at fault.

Typhoid fever epidemics have often been traced to infected water supplies, yet it is seldom that the typhoid bacillus itself has been isolated from such waters; chemical and bacteriological tests indicating sewage contamination are considered sufficient evidence, and the possible presence of typhoid inferred. Were we to search for the typhoid bacillus itself in these waters we would obtain many negative findings, but such negative evidence is of no value, the waters must still be considered unsafe.

Diphtheria and typhoid, as we know, frequently become epidemic through means of infected milk, the milk offering advantages for the spread of these diseases that provisions ordinarily do not, since milk is itself a culture medium and the living organisms which are introduced find nourishment, which encourages their multiplication; yet to seek by bacteriological examination to isolate these organisms from market milk would be an almost hopeless task, since the milk supply, as a whole, is comparatively free from infection, and when because of an outbreak of some infectious disease attention is drawn to any particular supply a sufficient

time has elapsed to allow the cause of contagion to disappear from the milk.

If, then, in polluted waters known to be contaminated with typhoid, or in market milk which when infected serves as a culture medium, the finding of these organisms of infectious disease is attended with such difficulties, we must confess that the chances of finding them by any examination we might make of exposed provisions are so exceedingly slight that such tests would be worthless.

We might, for instance, undertake feeding experiments, but knowing beforehand that our rabbits and guinea pigs thrive on provisions which have been exposed we could not hope by this means to gain much knowledge.

Culture experiments might be undertaken, exposure of sterile plates of nutrient media to the air, under similar conditions with provisions, or filtration of the air through sterile filters, plating of the bacteria thus filtered out, and the examination of the colonies obtained by species tests.

Inoculation experiments might be made of these bacteria as a test of their pathogenicity.

A thousand tests made along these lines would be of about the same value in relation to the question we are discussing as would a thousand tests of market milk for typhoid or diphtheria bacilli, were we endeavoring to find out whether such diseases were ever conveyed by milk.

In fact, such tests would be distinctly harmful, so far as the contention that the practice was prejudicial to health is concerned, in that the negative character of the results might be interpreted as meaning freedom from danger.

Study of Conditions Involved. A more profitable way to approach the subject would be through a study of the conditions involved, and an application of our knowledge as to the vitality of disease bacteria under similar conditions.

Provisions. Let us first consider the articles commonly xeposed and what they offer in the way of protection, either by natural covering or by the common processes of washing

or cooking, for it should not be overlooked that many articles of produce, meats, fish, vegetables, etc., are thoroughly cooked before being eaten, so that danger from exposure of such articles would seem to be slight aside from the results of decomposition changes which might take place through action of putrefactive bacteria. The edible parts of such fruits as bananas and oranges are also thoroughly protected.

Apples, pears, peaches, plums, cherries, grapes, berries of various kinds, dates and figs, on the contrary, are frequently eaten just as they are purchased without preliminary washing. This is, of course, also true of such foods as are sold already cooked and of candies, and whatever danger there might be would seem to be confined chiefly to these latter classes of foods.

Means by which these Foods might become Infected with pathogenic organisms are, of course, many. The most important and ordinary means would be by handling, but this does not enter into our discussion, since the foods must be handled whether exposed or not, excepting so far as they might be handled by passersby. Such handling by persons having organisms of disease on their hands would deposit the latter in a moist and virile condition and, if the food were brought and consumed shortly after, might cause disease. Coughing and sneezing by passersby might be another slight source of danger, but the chief causes of our apprehension would be from dust and flies.

Dust. The dust of city streets consists chiefly of dried and pulverized horse manure; it also contains sweepings from houses and stores, ashes, and dried refuse material of a thousand varieties, and mention should also be made of dried sputum which may contain living tubercle bacilli.

Aitken's observations led him to estimate one cubic inch of air in the open country as containing 2,000 dust particles, in a city 3,000,000.

Soper in his work in connection with the New York subway found in New York streets that the average number of bacteria

settling from the air in fifteen minutes in a 3½-inch petri dish was 1,157. The average number obtained by filtering the air was 6,500 to a cubic centimeter.

Five times as many were obtained when the wind was eighteen miles an hour as when it was at nine miles.

Bacteria in Dust. The bacteria of dust are of the more resistent types and, for the most part, harmless, since few of the disease bacteria can long withstand light and drying.

Hill, in 1902, exposed cultures of diphtheria and specimens of tubercular sputum dried on glass rods to diffuse light and found 90 per cent of the diphtheria and all the tubercle bacilli killed in three weeks. Diffuse daylight hinders the growth of diphtheria bacilli, even when other conditions are favorable, while direct sunlight has a very powerful bacteriacidal action. Experiments in 1907 in the Boston Board of Health Laboratory showed tubercle bacilli capable of producing the disease in animals at the end of thirty-one days' exposure to diffuse light These experiments, it must be understood, were carried on with material which deposited in a moist condition was allowed to dry on either the glass or wood used, emulsions with sterile water of these dried bacteria being used for the inoculation tests. It is probable that drying was insufficient in any of these experiments to permit the bacteria thus exposed to enter the air as dust particles; action of direct sunlight was carefully prevented.

Concerning typhoid Whipple says (pp. 42, 43): "Moisture is essential to the growth of the typhoid bacillus as it is to all vegetable life. Drying is for this organism more fatal than it is to many forms, and even a short period of dessication results in death. So far as is now known the typhoid bacillus does not form spores, and there is little or no danger to be feared from dust or from the air, unless this dust or this air has had opportunity for recent infection."

The danger from dust should not be wholly ignored, for although no spores of the typhoid germs have ever been discovered experiments have indicated that among the many

individual cells of a culture a few often seem to have powers of resistance against an unfavorable environment far above the general average. Furthermore, a particle of dust dried only on the outside may harbor living germs within. Generally speaking, however, drying kills the typhoid bacillus."

Considering tubercle bacilli Jordan says (Jordan's Bacteriology, p. 336): "Sputum that is completely dried so that particles are capable of floating as dust in the air may be infective for eight or ten days, rarely longer." "Exposure to sunlight readily effects the destruction of tubercle bacilli, especially in the presence of abundant oxygen supply. The conditions of exposure determine the time necessary to produce death, but, broadly speaking, bacilli from cultures are killed in a few minutes to two hours, while bacilli in sputum require twenty to thirty hours, or even longer."

Excepting for the possible presence of tubercle bacilli, the danger of contracting contagious disease from dust would seem to be slight indeed, unless such dust was very recently infected, and in the case of tuberculosis the danger seems rather in inhalation of infected dust than through chance deposit of a few bacilli on exposed provisions. Weakened as these bacilli must be in the process of drying sufficiently to be wafted about as dust they might find in the lungs conditions sufficiently favorable to nurse them back to virulence, but would hardly survive passage through the stomach.

Then, too, there are many days that are not dusty, during or after storms, or any time when the streets are wet, frozen or covered with snow, when dangers from dust would be reduced to a minimum.

Street sweeping at night, such as is usual in market districts, is to be commended, thus avoiding the stirring up of large quantities of dust during the day when the streets are crowded. Oiling and watering the streets are wise sanitary precautions, and money spent on these means of keeping our streets free from dust is saved a hundred times over in the health of the

people, since these tiny irritating dust particles drawn into the lungs are a source of danger compared to which the danger from eating exposed provisions is small.

Flies. As we have seen there is little need of apprehension as to the infection of provisions by organisms sufficiently dry to be carried about in dust. Through flies we have a means by which if opportunity offers organisms, in a moist condition, may be so transferred. The average fly is equally fond of filth and food, and frequently passes from one to the other when both are exposed to his depredations.

I quote from Whipple again (Whipple, p. 67): "Flies may transmit the typhoid bacillus in two ways, by the fecal matter containing the germ adhering to the fly and being mechanically transported, or by the fly taking the germ into its digestive organs and depositing it with its excrement. An interesting illustration of the first method of transmission was the experiment made by some one who sprinkled lime in a privy vault and exposed a chocolate-frosted cake in front of the kitchen window not far distant. It was not long before the white tracks of the flies were found on the cake. A more definite experiment was that made in Chicago where flies caught in certain privy vaults were examined and found to contain *B. typhi*.

Some experiments have been conducted to ascertain the duration of life of the typhoid bacillus on the bodies of flies fed on infected milk. These experiments were not wholly satisfactory, but Fischer states that he found them there twenty-three days after infection."

(Whipple, p. 191): "In the autumn of 1904 a typhoid outbreak occurred in the New Haven County jail. Out of 256 prisoners there confined, 20 were attacked between October 6 and November 15. A study of the situation by Prof. H. E. Smith and Mr. Edward Mahl resulted in the exoneration of the water supply and the milk supply. They found that on the street adjoining the jail there were five dwellings in which cases of typhoid had occurred between August 2 and

September 17. The privies in the rear of these houses were in a very filthy condition and, in several instances, fecal matter was found lying exposed on the surface of the ground. The food furnished to the prisoners was prepared at the jail and often exposed on tables in front of open windows, which were not screened. Flies were abundant at the time, and it is a well-known fact that at that season of the year they seek the warmth of houses. The investigators concluded that the outbreak was due to the transfer of infectious matter by flies from the privies to the food furnished the prisoners."

Such cases are interesting as showing the probable danger from flies where unsanitary conditions prevail.

Danger of infection of exposed foods would certainly seem to be great where flies had access to these, and also to infected feces. In a city where sewers are so universal as in Boston, however, we need fear little danger from typhoid infection of food by flies. There remains a possibility of such infection, however, through carelessness or delay in disposing of typhoid stools.

There would seem to be more danger of flies carrying tubercle bacilli from sputa deposited on the streets. This danger, if present, has also been reduced by the well-enforced laws against spitting on the sidewalks; and by the instructions now given to all consumptives as to the infectiousness of the sputum and care necessary to prevent infection of others. Such danger as there is from flies, is of course, confined to the warm weather, and it must be said that in such weather, when conditions are most favorable for tranference of these bacteria, the agents of their destruction (light and drying) are also most active,

In bringing this paper to a close I cannot refrain from speaking of the frequency of erroneous ideas as to the vitality outside of the body of the organisms of the ordinary infectious diseases.

Thirty years ago the germ theory of disease had to fight for recognition, now the pendulum has swung to the other

extreme and people are willing to believe the most improbable stories of germ infection.

Bacteriologists, health officers and physicians are in a way responsible for this, since it is only of late that such a theory as danger of infection from sewer gas, for instance, has been proven to be without much foundation in fact. Not knowing the limitations of bacterial resistance we have erred on the side of overcaution, and thus false impressions have been spread abroad as to the dangers of infection from *things*, and the greater dangers of infection from *persons* are overlooked.

These impressions are sometimes pandered to by writers in popular magazines.

The *Ladies' Home Journal*, for example, on its editorial page for June, 1904, offers the following:

"The Candy That We Eat

"A prominent physician, whose word is equivalent to that of the highest authority, was standing beside the candy counter in a large department store, not long ago, when he said:

"'Just look at those women buying that candy for themselves and their children. That candy has been exposed all day, while hundreds of people have passed by, shuffling their feet and raising thousands of particles of dust from the floor.

" 'Most of that dust is brought from the street and contains every kind of the most dangerous germs and microbes of disease. Candy is, of course, sticky, and on account of its adhesive character everything sticks to it.

" 'Last week I came here and bought a quarter of a pound of each of four different sorts of candy which had been exposed on that counter only during the morning—just three hours, remember. I put the mass under the microscope and amazed my clinic with what they saw. There were typhoid

and malarial germs absolutely without number; the candy was literally covered with them. It is natural, of course, that it should be.

"'Now these same women would not think of using a piece of meat that had been exposed without washing it and, of course, in the roasting or boiling process all bacteria are destroyed; the same with vegetables; but candy which, on account of its sticky nature, is a thousand times worse, is eaten just as it is bought and as it has laid exposed upon the counter, and yet mothers wonder why their children have diseases! It is a fact seldom realized that more germs are carried into children's systems through eating candies that have been exposed for sale than in any other way. [We cannot help wondering if the learned doctor ever heard of milk.] No candy should be bought unless it had been packed in a box directly after making, and under no circumstances should any be bought that has been exposed on a counter or in a box with the lid off; even when it is under a glass case there is danger, since its stickiness holds every grain of dust and throws nothing off.'"

Now since malarial plasmodiæ have never been discovered outside the bodies of the human or mosquito hosts, and since the isolation and proving the identity of the typhoid bacillus is a piece of work requiring several days this story, so far as it relates to these organisms, is false on its face. The evil of it is, in the fact, that ninety-nine out of a hundred who read such an article believe it to be true, and not only live in fear themselves, but pass on such false eachings to others.

Another writer who states he is a health officer writing for a popular "Mothers Magazine," makes this extraordinary statement:

"A single rotting potato left in a dark corner of the cellar will generate enough typhoid and diphtheria bacilli to infect a whole community."

Uncle Remus Home Magazine for January, 1909, offers this

contribution which, while not so glaring in its errors, conveys the same idea:

"I had a surprise this afternoon," said the feather-brained wife of the city councilman. "Maude Whitney has been telling us that her husband has been appointed sanitary inspector. Of course I thought it was a respectable business where he would sit before a desk and dictate to a typewriter. Well, this afternoon he was here spying about in my back yard, poking into that rubbish heap in the corner and smelling out that little pool where the Pekin ducks like to paddle, and he said they must be done away with; they were a menace to health; and I found out that was his business — poking about in back yards. That's what a sanitary inspector is, and I thought it was some *important office*."

"It is the most important office in the city," declared her husband, "for its mission is to preserve health and prevent disease. Do you know how many deaths there were in this city last week from typhoid fever and diphtheria? And much of this sad mortality is due to the condition of the back yards of such careless people as we are."

The writer in the *Ladies Home Journal* was correct in one particular: candies should be kept covered and not open to all kinds of exposure.

The *Mothers Magazine* writer was correct in his opinion, that it was a wise, sanitary precaution to keep the cellars clean.

The writer in *Uncle Remus Home Magazine* was correct in his contention that it was most important to keep back yards clean, and had he spoken of yellow fever and malaria instead of typhoid and diphtheria, his article might have passed without adverse comment, for these diseases are spread by mosquitoes which might breed in the puddle spoken of; but all these articles convey false impressions, the first two, in fact, are direct falsehoods.

Let us teach people to be clean, but not attempt to frighten them into it by untrue statements which, eventually, will react and do more harm than good.

There are surely enough dangers, real, active, at hand, without manufacturing imaginary ones.

The writer would not wish to be misunderstood in anything he may have said as being opposed to protection of food stuffs from dust and flies. Such protection should be demanded, if only from the standpoint of common decency and cleanliness. Viewed from the standpoint of *public health* he draws the following conclusions:

1. Such exposure of fresh meats and fresh fish is harmful chiefly because of more rapid decomposition changes which may take place.

2. Exposure of vegetables which are commonly washed and cooked before being eaten cannot be condemned.

3. We must recognize the presence of possible danger from dust and flies in the exposure of cooked foods, or of such other foods as are commonly eaten without preliminary cleansing or cooking, although in a city with modern sanitary arrangements there is probably very slight detrimental effect on the public health.

DR. BURR. Dr. Slack has taken up this question from the side of the danger of the transmission of disease to persons from exposed food articles so well that there is little left for me to say on this point. I think he is right when he says that contagious diseases, and I would include tuberculosis, are probably not transmitted through the agency of foods exposed to dust and dirt. The danger from dried sputum would be nothing compared to the handling of food articles by consumptive patients.

The question of flies as a carrier of disease is of course more or less serious. Dr. Slack states: "Through flies we have a means by which, if opportunity is offered, organisms may be transferred." I would say that if flies are a carrier of disease that there is no end of opportunity for them to transfer it to exposed food articles. An expression of opinion as to the amount of exposure cannot be exaggerated. The

practice of exposing food articles has increased to disgusting conditions. All sorts of cooked and uncooked meats, fish, lobster meat, oysters on the half shell with lemons all ready to serve, cut meats, as steaks, roasts, etc.; dried beef, pickled meats, and about every other description of food, is now exposed on the streets, shelves, outside of windows, open windows, and the entire fronts of stores are now trimmed with these various articles. This practice, up to a few years ago, was confined to the large market district. It is a fast-growing practice in our suburban districts.

That the dust and filth of streets reaches these foods there can be no doubt. One has simply to travel through the market districts any dry, windy day to confirm this. This question, in my opinion, should be reached from the side of cleanliness, and not as to the danger of transmission of diseases.

We legislate against dirty yards, alleyways, etc., and we certainly should consider dirty foods as much of a danger as dirty yards.

Dr. Slack, in ending his paper, drew four conclusions. First, exposure of fresh meats and fish is harmful because of decomposition. I would say that the exposure of vegetables of all sorts should not be allowed. You will find bushel boxes on the sidewalks tilted up against buildings, exposed to all small animals.

Third, exposure of cooked foods should be forbidden, especially in summer. I should certainly make no exception of any season of the year. Foods are exposed to all filth as much during the month of March as at any other time.

Fourth, I do not think the question of the effect on the public health should be considered. This question should be considered from the standpoint of cleanliness.

I should favor any recommendations that might prohibit the unnecessary exposure of all food articles.

MR. NEWCOMB. I may say for Salem, as Dr. Durgin

did in regard to Boston, we are very happy to be in touch with our District Medical Inspector, Dr. Voss. Our relations have been very pleasant. At times I have been an eye-witness to the soiling of food of quite a perishable nature when placed upon the sidewalks, and have called it to the attention of the clerks and the proprietors of the places of business.

Through the following regulations we are trying to control this practice:

"CARE OF MEAT, POULTRY AND VEGETABLES

"REGULATION 27. SECTION 1. No person or corporation, individually or by his agents, servants or employees, shall transport meat or poultry of any description through the public streets or ways of the city of Salem, except in wagons or vehicles which have been thoroughly washed at least once in every twenty-four hours."

All meat or poultry transported through the streets and public ways must be thoroughly covered in such a manner as to preclude infection or injury from flying dust or other causes.

SECTION 2. No meat, poultry, fish, dates, figs, berries or shelled nuts shall be exposed for sale in any public street or way, or by the side of same, or in any open display window, unless covered in such a manner as to exclude flies and dust.

SECTION 3. No article intended to be used as food shall be exposed or displayed in any street or way, or in front of any place of business, unless the bottom of the box or other receptacle containing such articles, is raised, at least, twenty-four inches above the sidewalk, platform or landing upon which such receptacle rests.

We have found indications, at times, proving clearly that the owners were not living up to the first section, but the general compliance is good.

DR. A. W. PACKARD. This is a matter in which the board

of health in the city from which I come (Brockton) is vitally interested. In June, 1905, that board adopted a regulation as follows:

"SECTION 1. No person shall allow the body of any animal, or part thereof, or any bread, pastry, poultry or other provisions which may be used as human food, to be carted or carried through the streets or avenues of the city of Brockton, unless it be so covered as to protect it from dust, dirt and flies.

"SECTION 2. No cherries, blackberries, huckleberries, raspberries, strawberries, grapes, dates, figs, salted peanuts, cracked nuts of any kind, corn cakes, corn crisp, candy of any description, maple sugar, or any other article, or food stuff which may be used for human food without cooking or peeling, shall be kept or exposed for sale in any street, or public place, or outside of any shop or store, or in the open window, or doorways thereof, unless they be kept covered so that they shall be protected from dust, dirt and flies.

"SECTION 3. No vegetables or other articles which are to be used as human food shall be kept, or placed, or exposed for sale outside of any shop, store or market, or in the open window or doorways thereof where it is possible for such vegetables or other articles to be contaminated by dogs.

"SECTION 4. Every person being the occupant or lessee of any room, stall, building, or place where any meat, fish, birds, fowl, milk, vegetables, butter, fruit or other articles intended or held for human food, shall be stored or kept, or shall be offered for sale, shall put and keep such room, stall, building or place, and its appurtenances, in a clean and wholesome condition; and every person having charge or interested or engaged, whether as principal or agent, in the care or in respect to the custody or sale of any meat, fish, birds, fowl, milk, butter, fruit, vegetables, or other articles intended for human food, shall keep, protect and preserve the same in a clean and wholesome condition, and shall not allow the same, or any part thereof, to be poisoned, infected or rendered unsafe or unwholesome for human food."

This regulation has not only been in force for three years, but it has been subject to the action of the courts and has been sustained. It is a fact that it is possible to enforce this regulation in small cities while, as has been intimated, in larger cities, like Boston and New York, it is much more difficult. New York has a very similar regulation, but they admit, on account of their size, that it is impossible to enforce it, and in Boston it is a very great problem; but in smaller cities it is possible to enforce the regulation. I wish that we had time and might discuss this regulation, and that the

board of health of this city might know whether the regulation has the indorsement of this Association of boards of health or not. Are we too far in advance of the education of the public? If so, should we come down, or should we bring, by education, the public up to an actual compliance with the regulation? I should like to know what the mind of the boards of health of the smaller cities and large towns is in regard to a regulation of this kind.

DR. DURGIN. It was with a view of getting a general expression from boards of health of the State that this paper was produced, and it was with the hope of securing, ultimately, united action on the question. It is exceedingly important that this question should be discussed by boards of health, as it will fall to them to create and execute regulations in this case. It seems to me important that there should be a committee of judicious, experienced men, to consider and report how far we may go in the prohibition of a custom which has grown to great dimensions, and is a source of much anxiety, especially with those who have assumed that it is seriously dangerous. Whether it has a large or a small degree of danger, it is sufficient that we know it to be an unclean procedure and attended with some risk of infection.

DR. SLACK. I would like to say that I heartily agree with what has been said by these gentlemen, and it seems to me that it is right along the line of the paper. I was asked to examine the subject simply in relation to its effect upon the public health. The remarks have been chiefly as to the cleanliness, and on that we all agree that the custom is an unclean one and a filthy one, and should be abolished. I would like to make a motion, that a committee of three be appointed by the president to report at the next meeting as to what extent exposure of food stuffs for sale should be prohibited by boards of health.

The motion was adopted, and the following committee appointed:

Dr. Slack, of Boston.
Dr. Emerson, of Springfield.
Dr. Packard, of Brockton.

PERSONAL HYGIENE

By PERCY G. STILES, Ph.D.

Instructor in Physiology, Massachusetts Institute of Technology

THE EFFECT OF SHAKING UPON ENZYMES. Certain curious facts reported by Dr. S. J. Meltzer and his associates at the recent meetings of the scientific societies in Baltimore, seem to call for comment in this place. These workers have shown that a solution of pepsin may be entirely deprived of its digestive virtue by prolonged and vigorous shaking. They have found that such a solution may be greatly weakened by the odd expedient of placing it in a sealed tube and introducing this into the stomach of a dog, where it remains for twenty-four hours. The contents of the tube thus suffers the combined effects of gastric, respiratory and bodily movements of the "host." It has been demonstrated that bacterial toxines may be weakened, or rendered inert, by similar agitation.

The chief reason for mentioning these observations is the possibility of misunderstanding their meaning and scope. It will not be strange if popular articles are soon printed in which these facts are used to enforce a claim that digestive juices in the body require quiet conditions for the performance of their work. It will puzzle some more careful thinkers to reconcile the new statements with the plain truth, that moderate stirring of a mixture undergoing digestion promotes the process instead of retarding it. A mild cradling and overturning of the fluid contents of the stomach and intestine goes on constantly, though it is gentler than the layman is

apt to assume. Food in the alimentary canal is subject to the same physical disturbance by the local musculature, the diaphragm, and the general movements of the body which proved so injurious to the enzyme in Meltzer's experiment.

The point to be emphasized is that it is quite a different matter to shake an enzyme alone from what it is to shake it with a substance on which it can act. Enzymes readily adhere to other materials. This has been shown by the employment of harmless precipitates such as calcium phosphate to remove enzymes from solutions. Organic colloids may act in the same way. Now, if it is a property of enzymes to adhere (to undergo adsorption) upon a foreign surface of any kind, then we can understand why shaking a digestive solution may destroy its power. The enzyme may be removed by contact with the walls of the container, the agitation merely insuring that all portions of the solution make such contact. Doubtless some glass beads in the vial would hasten the removal. It is also conceivable that the molecules of the enzyme when shaken may condense into inactive aggregates.

It will be quite otherwise when the food to be acted upon is present. The shaking which before tended to deposit the enzyme in a useless film upon the enclosing surface, or to throw its molecules together in inert clumps, will now favor the adhesion of enzyme and substrate. This is not a permanent entanglement like the other, but is the preliminary condition of digestion. The enzyme is soon set free as an incident of the cleavage, and is ready to be used again. We think that in this way the seeming contradiction between Meltzer's results and the common practice of stirring mixtures to promote enzyme action happily disappears.

It seems safe to predict that before long we shall read in the Hygiene columns of magazines statements to the effect that the workers in the Rockfeller Institute have proved that muscular exercise suspends digestion — a new argument in

favor of after-dinner naps in the manner of the carnivora. We may admit that violent activity after a full meal is undesirable, but the reason this is so is not the sensitiveness of pepsin to shaking. It is, doubtless, the difficulty of supplying blood adequately to all parts of the body at the same time, coupled with the loss of water through the sweat-glands, which may tend to lessen the digestive secretions. The instinct which leads us to rest after eating is a physiological one, but fortunately, for our efficiency, it is felt only within the first quarter of the period of digestion. Most of the necessary changes in our food are made in the later hours of the period when we are as active as we choose. If we can secure a good initial flow of the juices the danger that we shall shake them into impotence appears quite remote.

VETERINARY HYGIENE*

By W. L. BEEBE, D.V.M.

Bacteriologist for the Minnesota State Live Stock Sanitary Board

THREE DISEASES IN ANIMALS WHICH HAVE RECENTLY ASSUMED IMPORTANCE TO THE STATE SANITARIAN.* In this article J. R. Mohler, chief of the Pathological Division, Bureau of Animal Industry, calls attention to the existence in America of infectious anæmia (swamp fever), chronic bacterial dysentery (Johnne's disease and mycotic lymphangitis (pseudo farcy).

Infectious anæmia is also called American sura, malarial fever and typhoid fever in horses. The cause has been definitely determined as an ultra-microscopic organism, that is capable of passing through the first Pasteur filter.

The disease is most prevalent in low badly-drained sections of the country, although it is also present in altitudes 7,500 feet in height, on marshy pastures. The disease is characterized by progressive pernicious anæmia, remittent fever, polyuria and gradual emaciation while the appetite remains good. The duration of the disease is from three months to a year, or even longer in some cases. The temperature may rise to 103°, or higher, while the pulse will reach 70 beats per minute. The temperature usually remains high for several days, then gradually drops to about normal, but raises again at irregular intervals. The blood shows a gradual but marked diminution in corpuscles, the count running as low as 2,000,000 per cubic millimeter. Œdematous

* Paper read at the Interstate Association of Live Stock Sanitary Boards, September, 1908, and published in the American Veterinary Review for November, 1908.

swellings sometimes appear on the lower lip, point of elbow, sheath, legs, under the belly, or on some other pendant portion of the body.

The most marked lesions after death are marked emaciation, effusion in the pleura, pericardial or abdominal cavities, and many times petechial hemorrhages in the subcutaneous or muscular tissue, the heart, lungs, on the pleura or peritoneum. The heart is usually enlarged, and of a very pale color. The kidneys may appear normal or anæmic and flaccid. Microscopically they usually show a chronic parenchymatous degeneration. Many times some of these lesions are absent; in fact, it is surprising to see how few macroscopical lesions are present.

The mortality is about 75 per cent, and so far treatment has been very unsatisfactory.

Mycotic lymphangitis is a chronic contagious disease, particularly to equines, caused by a specific organism, *saccharomyces farciminosis*. It is characterized by a suppurative inflammation of the subcutaneous lymph vessels and the neighboring lymph glands. In chronic cases it is very easy to confuse with glanders, but a microscopical examination will reveal the saccharomyces in unstained specimens as slightly elongated bodies, 3–5 microns long, and 2.4–3.6 microns broad, with highly refractory double outline. The presence of this disease in the United States was first observed by Pearson in Pennsylvania in 1907, although it is possible that it had existed in this country for many years. Since that time its appearance has been established in Ohio, Iowa, California and North Dakota, and there is a probability that it exists in several other Western States. It is quite prevalent in Porto Rico, Hawaiian Islands and the Philippine Islands.

Treatment consists at the onset of the disease of exterpation of the nodules, lymph vessels and lymph glands in the vicinity. The organisms are highly resistent to antiseptics so very strong solutions should be used.

Chronic Bacterial Dysentery, or Johnne's disease, is a chronic infectious disease of bovines, caused by an acid-fast bacillus resembling the tubercle bacillus. The disease is characterized by marked diarrhœa, anæmia and emaciation, terminating in death. The duration of the disease is from six weeks to a year, or even longer.

The lesions observed upon post-mortem are remarkably slight, and out of all proportion to the severity of the symptoms manifested. The most marked lesions are present usually in the small intestine, especially in the last third, and occasionally the large intestines are also involved.

The intestinal mucosa shows a wrinkled or corrugated appearance. The mesenteric lymph glands are usually somewhat enlarged and appear watery on cut section. The acid-fast bacilli can be easily found in smears from the affected intestinal mucosa or lymph glands.

Recently this disease has been observed by Pearson in Pennsylvania, Beebe in Minnesota, Mohler in Virginia, and in an imported heifer from the Island of Jersey at the Athenia quarantine station ofthe Bureau of Animal Industry.

Foot and Mouth Disease in America. For the second time in recent years the Bureau of Animal Industry, United States Department of Agriculture, has been engaged in combatting foot and mouth disease, which was first recognized in this country Nov. 11, 1908. The States where this disease made its appearance were Michigan, New York, Pennsylvania and Maryland. The work of eradication has been carried on vigorously in coöperation with the State authorities. The diseased and exposed cattle were slaughtered and buried, and the premises disinfected. The Department paid the owner of the cattle two-thirds of the appraised value, and the remaining third was paid by the States.

One hundred and forty-eight herds were found affected, and the cost of paying for the diseased cattle amounted to $88,269.08. The prompt mastery of this highly-contagious and dreaded plague, which is always more or less prevalent,

speaks highly for the Bureau of Animal Industry. The general public and the live stock interests of the country are fortunate in escaping great disaster that would have resulted had this disease once become established in the western States, where the cattle raising is carried on extensively. There is a slight possibility that this disease may again appear on some of those infected farms, but as they will be constantly guarded no great harm may come from it.

MUNICIPAL SANITATION *

By CHARLES V. CHAPIN, M.D.

Superintendent of Health, Providence, R.I.

TYPHOID CARRIERS, INTERMITTENT ELIMINATION OF BACILLI.† Attention has previously been called to the fact that bacilli are not constantly present in the feces of carriers. Davies and Hall (*Lancet*, Nov. 28, 1908, page 1,585) have still further studied the carrier whose history had been reported. They find that the feces remained free from bacilli for considerable periods. Semple and Greig,* working in India, report three carriers, the daily examination of whom resulted as follows: In one the urine contained typhoid bacilli on Aug. 7, 1907. It was then examined daily with negative results until September 8, when the bacilli reappeared. In another case the feces showed bacilli on August 12 and 13, and then daily examinations were negative until August 29, when typhoid bacilli were again found. Another carrier's feces had a free interval from August 1 to September 6, and another from August 7 to October 21, a period of seventy-five days. In the light of such evidence it seems very unwise, at present, to attempt to rely on bacteriological examination of feces and urine to determine whether a person is infected and a danger to the community. The difficulties in the way of applying such a test to determine when restrictions shall be removed from typhoid patients, as for instance when connected with the milk business, are very great, and as it now appears to be extremely unreliable health officers had best not attempt to rely upon it.

* American Journal of Public Hygiene, Vol. XVIII, p. 350.

† Sci. Memoirs, Medical and Sanitary Departments Government of India, n.s., No. 32, p. 8.

SANITARY ENGINEERING NOTES

By ROBERT SPURR WESTON
Assoc. M. Am. Soc. C.E.

SERIOUS POLLUTION OF THE PREGEL, ITS CAUSE AND REMEDY.* The water of this river had never previously caused trouble when, toward the end of July, 1905, at the town of Konigsburg, it suddenly became black, and for about a week gave off very offensive odors. Investigation showed that for several years a cellulose manufactory above the city had been discharging its waste into the river at a rate that had reached about 48,000 kg. of dissolved organic matter, or the equivalent of 240,000 kg. boiled potatoes per day. The fall of the Pregel is very slight, and it empties through two mouths, one of its branches flowing west, so that when strong west winds prevail the water backs up from this side. As west winds are only common in winter this had hitherto caused no trouble, but at the time in question strong west winds had blown for a week during hot weather. During this period there must have collected at the city almost 700,000 kg. of organic matter which, in the presence of the organisms supplied by the river mud putrefied most effectively. To remedy this condition of affairs it was finally decided to pump the acid calcium sulphite in which the wood is boiled in the course of the process, and the first wash waters, after reduction of the acidity to 0.06 per cent by addition of lime, into the drainage canals which empty upon irrigation fields. This arrangement will be in operation in the course of another year.

H. R. HOSMER.

* Lassar-Cohn, Chem. Ztg., 81, 980-81 (Oct.).

WATER-SOLUBLE HUMUS MATERIAL IN THE NORTHERN SWEETWATERS.* From results of analysis of the seven largest rivers of Finland the author estimates that the iron humus matter emptied into the sea by them is about 1,400,000,000 kg. per year. These rivers represent 90 per cent of the total drainage of the country. Complete analyses were made on six lake and river waters, and the humus matter from each was precipitated by addition of the proper amount (determined separately for each water) of $FeCl_3$ and analyzed for C, H, O and N content. The results were as follows:

Water from	C	H	N	O
1. Wanda (filtered)	46.87	4.42	2.29	46.42
2. " (unfiltered)	47.11	4.80	2.20	45.89
3 a. Lake Kalaton	54.10	3.86	2.32	39.72
3 b. " "	52.94	4.09	1.90	41.07
4. Lojo-See	44.99	5.05	2.07	47.89
5. Moor-See Ukonlampi	48.98	4.24	2.88	43.90
6. " " Heinälampi . . .	46.19	4.42	1.46	47.93
7. " " Myllylampi im Kirchspiel Lojo	52.03	4.98	4.23	38.76

These results do not indicate any definite compound, though aside from the low proportion of *N* the composition approaches that of albuminoid substances, as there is little or no ammonia in the water. *S* is sometimes present in traces, and small amounts of *P* in organic combinations are always found. Decomposition by dilute alkalis and precipitation of alkaline solutions by acid indicate that the humus matter has the characteristics of an acid of about the strength of phenol. Analyses show that though the metals are not present as any definite compound with the coloring matter, the proportions vary only between narrow limits. Normal salts of bivalent metals do not cause decolorization of the water except $FeSo_4$, which requires so long that probably it undergoes oxidation first, and $MnSo_4$ which, after several days, gives a precipitate of black gela-

* O. Aschan (Helsingfors, Lab. Univ.), J. pr. Chem., 77, 172-88. (Feb. 6)

tinous hydroxide, in whose formation the humus must play a part since it does not take place in distilled water. $Al_2(So_4)_3$ and $SnCl_4$ also decolorize. If more or less than the precipitating quantity of $FeCl_3$ be added to the water it grows gradually darker up to a certain point, after which it may remain unchanged for a number of days, at last precipitating all at once. Small quantites of acid or alkali cause immediate precipitation, hence the deepening color is not due to hydrolysis. Moreover, the strongly-dissociated salts as NaCl prevent precipitation to a greater extent than do strong acids or bases, showing that is not an ion effect alone.

BIOLOGICAL PURIFICATION OF SEWERAGE ON A LARGE SCALE.* A reply to a communication of M. Vincey, advocating the agricultural irrigation system of sewage disposal for Paris. The author contradicts his opponent's statements in detail, claiming that his analytical data are unreliable, his deductions incorrect and his estimates unfair and prejudiced. The paper is made up almost wholly of statistics and quotations to show the advantages of the bacteriological treatment.

CALCIUM CHLORIDE AS A PREVENTIVE OF FREEZING IN AUTOMATIC SPRINKLER SYSTEMS.† A strong solution of $CaCl_2$ is introduced into the pipe system, and kept from diffusion back into the water main by check valves. It is found that, in spite of the high coefficient of expansion of $CaCl_2$ solutions, no contrivance for relieving the pressure due to change of temperature is necessary, because the elasticity of the network of small pipes is sufficient.

R. S. WESTON.

* M. B. Bezault, Bull. Soc. Encouragement, 110, 23-48 (Feb.).

† Eng. News, 60, 550.

BIOLOGICAL LABORATORY NOTES

PRODUCTION OF DISINFECTANT GAS.* The author finds that if three parts of water be added to a mixture of one part of paraformaldehyde and two of $CaCl_2$, formaldehyde gas is freely liberated. This gas contains only traces of Cl and does not exert an injurious effect except upon certain aniline dyes. Mildew spores under two layers of cloth were killed in seven hours in a test made in a room containing 20 c.m., with 125 g. of aldehyde. Subtilis required seven days.

H. R. HOSMER.

USE OF CONCENTRATED SALT SOLUTIONS IN DIFFERENTIATION OF BACTERIA. SEPARATION OF *B. TYPHI* FROM *B. COLI*.† The author claims that the addition of 20 per cent Na_2So_4 to a broth tube does not affect the manner of growth of *B. typhi* producing uniform turbidity, but causes the *B. coli* to agglomerate and finally settle in compact form. Phosphates produce the same effect, though nitrates, chlorides and non-electrolytes do not. *B. enteritidis* and *paratyphi A* (Byron-Kayser) behave like *B. coli*, distinguishing them from *paratyphi B* (Shottmüller) and the bacillus of Achard. If a U tube be prepared with a plug of cotton inserted down to the curve, filled with broth and inoculated, after growth becomes apparent it will be found that the liquid above the plug contains a pure culture of typhi while coli remain at the bottom.

H. R. HOSMER.

* G. Carteret, Comp. rend. 146, 819-20 (April 13).

† M. A. Guillemard, Compt. rend. 146, 1177-9 (June 1).

A NEW GENUS, PARASITE OF CHRYSOMONADINA. LECYTHODYTES PARADOXUS.* This parasite has an elongated form pointed at the extremities, and furnished with two flagella. It enters the sheath of the chromulina through the neck elongating itself for the purpose like an amœba, and then absorbs the protoplasm of its host until it fills the whole shell. The organism remains without cell wall throughout its existence, multiplying by means of zoospores formed by successive bi-partition, accompanied by a corresponding division of the nucleus. These zoospores often remain for some time in the sheath of the chromulina, at last passing out through the neck as they entered, being ready, then, to attack new victims.

H. R. HOSMER.

* P. A. Dangeard, Compt. rend. 146, 1159-60.

PUBLIC HEALTH LEGISLATION, NEWS AND NOTES

By F. H. SLACK, M.D.

Director Boston Board of Health Laboratory

PACIFIC COAST PUBLIC HEALTH ASSOCIATION.* The State Boards of Health of California, Oregon and Washington, together with the representatives of the health departments of the principal cities of these States, held a meeting in Portland, December 15, and perfected an organization to be known as "The Pacific Coast Public Health Association."

The object of the association is uniform and harmonious work in protecting the Pacific coast against communicable disease.

The following resolutions were adopted:

> The association desires to publicly recognize the character and value of the work that has been done in the places on this coast where bubonic plague has appeared. This work has been successful in stamping out the disease among human beings and reducing it to a minimum among rodents; achievements of no small moment, when the general history of the disease in the present pandemic is taken into consideration.
>
> But while recognizing the thoroughness and the value of this work, the association desires to call attention to the peculiar nature of the disease, in that its permanency in a community does not depend upon its existence among human beings, but rather among rats. And while the epizootic is at present held in abeyance, its peculiar pesistence must not be forgotten. In view of the foregoing, this association does hereby resolve:
>
> First, That, in its opinion, the necessity of continuing the work of fighting the disease in the places where it has made its appearance still exists, and that the work should continue unabated for an indefinite period. Such work to include the catching and extermination of rodents.

* Monthly Bulletin, California State Board of Health, November, 1908.

Second, That reasonable precautionary regulations for vessels should be continued, this to include the fumigation of vessels in accordance with a uniform plan for all ports interested.

Third, That all municipalities of the States and provinces included in the boundaries of this association, shall put uniform preventive measures into effect in accordance with recommendations of the association.

Following are the recommendations adopted:

1. The destruction and examination of rats for the plague.
2. Disinfection of all vessels at least once each month.
3. Sanitary improvements of such character as to secure efficient collection, care and destruction of garbage and stable offal.
4. Rendering all buildings, docks, warehouses, markets, etc., rat proof.

With reference to the subject of tuberculosis the following resolutions were adopted:

The Public Health Association of the Pacific Coast, while recognizing the necessity for travel on the part of those afflicted with tuberculosis, desires, nevertheless, to call the attention of the medical profession to the evident danger to the public health necessarily involved in such travel, when the individual is ignorant of proper methods of personal hygiene, or wilfully negligent of the same.

1. That physicians discourage, as far as possible, travel in public conveyances by those afflicted with tuberculosis, and that when such travel is absolutely necessary, the patient be properly instructed as to methods of prophylaxis.
2. That the association use its influence looking to the enactment of State laws requiring the disinfection, at the company's expense, of all conveyances occupied by tubercular patients, before such conveyances are again used by the traveling public, and that pending the enactment of such laws, all local health officers be advised to secure such disinfection.

NEW YORK MILK MUST BE PASTEURIZED.* "After three years' study of the milk problem and practical experience in feeding babies, the New York Milk Committee, on December 5, promulgated a formal statement in favor of pasteurization as the method of securing safety from tuberculosis and other milk-borne diseases. The declaration of the committee was in the following terms:

*Florida Health Notes, January, 1909.

"During the past three years the attitude of the New York Milk Committee toward the use of pasteurized milk has been so frequently misquoted that we ask your attention to the following authoritative statement of its opinion and practices:

"The committee approves of the pasteurization of all milk which has not been produced under sanitary conditions, which has not come from tuberculin-tested cattle and cattle otherwise free from disease, and which cannot be supplied to the consumer with a sufficiently low bacterial content to offer safety from milk-borne infection.

"The committee approves of the pasteurization of milk when modified for infants' use in the home.

"The committee approves of all measures, individual, State or municipal, which will lead to the institution of sanitary conditions on dairy farms. The conviction has on two occasions led it to oppose measures directed toward the establishment of compulsory pasteurization of milk by the city or State authorities, on the ground that such measures would put the producers of dirty milk on an equal footing with the producers of clean milk, and thereby postpone the institution of the desired sanitary reforms."

At the last meeting of the board of aldermen an ordinance was introduced for the better regulation of the milk traffic. This measure, if adopted, will prevent the sale in this city of milk and cream not pasteurized that comes from dairies where herds are not certified by the board of health to be free from tubercular disease. The certificates would have to be renewed monthly. The first two sections of the ordinance read as follows:

"Section 1. On and after Jan. 1, 1909, no milk nor cream shall be sold at retail, or offered for sale at retail, in the city of New York, except as hereinafter provided, unless the milk or cream has been certified by the Department of Health as containing not more than 500,000 bacteria to the cubic centimeter.

"Section 2. All milk and cream not from certified herds, or not conforming to the said bacterial standard, shall be pasteurized by exposure for at least twenty minutes to a temperature of 167° Fahren-

heit, or by exposure for at least thirty minutes to a temperature of 158° Fahrenheit, under the supervision of the Department of Health, and sealed with a label showing said process, as hereinafter provided."

THE SECRETARY OF THE MASSACHUSETTS STATE BOARD OF HEALTH.* "Dr. Mark W. Richardson has been appointed Secretary of the Massachusetts State Board of Health in the place of the late lamented Dr. Charles Harrington, whose position since his sudden death on Sept. 11, 1908, has been unfilled. Dr. Richardson was graduated from Harvard College in 1889, and thereafter spent a year in foreign travel. He then entered the Harvard Medical School and received the degree of doctor of medicine in 1894. After serving as a medical house pupil at the Massachusetts General Hospital, he again went to Europe for a period of fifteen months, devoting himself to the study of general clinical medicine and pathology in Vienna, Dresden and Berlin. On his return to America he entered upon the practice of medicine, although his natural bent, even at that time, was rather toward laboratory investigation than the details of practice. He received the appointment of assistant in pathology at the Harvard Medical School in 1898, and in 1900 was appointed an assistant in the theory and practice of physic at the same institution.

"He is a member of the Association of American Physicians, to which he contributed a valuable statistical paper on treatment by the newer methods at its last meeting. He also holds membership in the American Association of Pathologists and Bacteriologists, the Boston Society of the Medical Sciences and the Massachusetts Medical Society. He has, at various times, held the Dalton scholarship at the Massachusetts General Hospital and the Bullard fellowship.

From the foregoing statement of Dr. Richardson's activities up to the present time it is not to be questioned that he has an exceptional training for the responsible position which

* Boston Medical and Surgical Journal, Jan. 14, 1909.

he is now called upon to assume. His work in bacteriology in relation to the theoretical problems of disease and his laboratory training in general *fit him peculiarly* for meeting the problems which *State health legislation* is now facing, and is likely to face, in increasing degree, in the years to come. It is also not to be doubted that his general interest in and knowledge of medicine in its more practical aspects, will be a valuable asset in the work before him. It is increasingly evident that the medical profession is coming to occupy a closer and closer relation to public affairs, and this must be particularly the case in the relation of State boards of health to the fundamental problems of sanitation and prophylactic medicine. The opportunity, therefore, which this position offers may hardly be overestimated, and it may be permitted us to say, especially in this State, which has long been a pioneer in matters of progressive health legislation. Dr. Richardson's predecessor, Dr. Charles Harrington, was a man of peculiar force and industry, and brought much credit to the position which he filled. We have reason to believe that Dr. Richardson will prove a worthy successor."

ANTI-VACCINATION LAWS IN UTAH. It has been repeatedly proven that a scourge of smallpox will, sooner or later, visit any considerable population unprotected by vaccination. It is strange, indeed, in this enlightened age, and in these United States, to see the population of a whole State submitting to a law which deprives them of the protection against this terrible disease which should be theirs. Truly, "experience is a hard school, but some there are who will learn in no other."

Dr. Beatty, Secretary of the Utah State Board of Health, in a supplement to the November, 1908, Bulletin issues the following warning to the people of the State which they will be wise to accept:

"Utah enjoys the unique distinction of having a larger proportion of inhabitants who are unvaccinated, and who

are opposed to vaccination, than any other civilized State or country. It is, therefore, practically unprotected from the invasion of smallpox, which has prevailed more or less extensively every year for the past nine years, and will continue to menace life and health, and burden the taxpayer until the irrational prejudice shall be overcome. The cause of this unusual situation was the fanatical crusade of the so-called 'anti-vaccinationists' at the time of the first outbreak in the State. Had it not been for the unfortunate influence which for many months they exerted in every way calculated to create prejudice against a harmless and beneficent measure, there is no reason to doubt that Utah would long since have been protected from the disease in the same degree as in other States.

"An additional handicap resulting from the anti-vaccination clamor is a law passed at the time which specifically removes from the health authorities, or others, the power to exclude unvaccinated children from school, or under any circumstances to enforce vaccination. This law is also unique, existing in no other State. On the contrary, most States require all school children to be vaccinated, and empower boards of health to enforce vaccination when it is deemed necessary for the protection of public health.

"The State at this time is threatened with a general outbreak of smallpox. It is extensively and increasingly prevalent in Salt Lake, and will, most certainly, be communicated to surrounding localities. The only means of prevention is *Vaccination*. This, if recent, will surely and without injury prevent the disease. To insure protection revaccination should be performed after five years. The many stories of serious results from vaccination are almost invariably untrue, and should not be accepted without proof. They are usually based on hearsay and circulated by those who oppose vaccination.

'People are urged to consider the subject with unbiased minds, and there can be no question as to their conclusions.

They owe this as a duty to themselves, their children and the State.

"Health officers and physicians are called upon to earnestly interest themselves in a campaign of instruction in order that the truth as to vaccination may be as widely circulated as were the former misstatements."

ANTI TUBERCULOSIS CRUSADE IN THE PUBLIC SCHOOLS.* "The Richmond Health Department has just issued a booklet on "Tuberculosis, its Causes, Prevention and Treatment," for use in the upper and middle grades of the public schools of Richmond. A little less than a month ago the Board of Health inquired from the School Board, whether they would consent to have this subject taught, provided the Health Department would furnish the pamphlet. The School Board showed the same active interest in this matter that they always evince in public health subjects, and at once consented. The pamphlet is one of twelve pages of text (in eleven point type), with two illustrations. It is written in very simple language. A copy will be given to each pupil in the grades in which it is used.

"Besides being used in the public schools, the principals of every private school in the city will be invited to have it taught in their schools, for which purpose the Health Department will furnish any desired number of copies.

"It is believed that this is one of the most important steps yet taken by the Health Department. As stated in the pamphlet itself: 'Every one of these deaths (from consumption) was caused by the ignorance or the carelessness of some one. When everybody understands just how tuberculosis is caused and how it can be prevented, and when everybody puts these lessons into practice, there will be no more tuberculosis;' but the task of teaching the majority of adults is hopeless. By having the subject taught in our schools, in a few years a considerable proportion of our citizens will

* Monthly Bulletin of the Health Department of Richmond, Va., December, 1908.

be thoroughly informed on the main points of prevention, and the results will be invaluable.

"Before beginning to use the present pamphlet in the schools a meeting of the teachers will be held, at which the subject will be gone over thoroughly and an illustrated talk given them, besides which the best methods of really instructing the children on the subject will be discussed. Not only will the children themselves be instructed, but a copy of this pamphlet, in simple language, going into so large a proportion of the homes of Richmond, a considerable number of adults will be taught as well. Any citizen of Richmond who has no child in the public schools and who wishes to have a copy will receive one on application."

THE CALIFORNIA STATE HYGIENIC LABORATORY,* Dr. A. R. Ward, Director, has just removed to its new quarters in the hygiene and pathology building, which the State University has just finished.

The space alloted to the laboratory is sufficient to provide for a staff of four or five assistants, ample provision having been made for incubator and special research room. An animal house will be constructed convenient to the laboratory, where mice, guinea pigs, rabbits and dogs can be kept for experimental purposes.

Provision has been made for the expansion of the work of the laboratory for several years, and it will be possible for the laboratory to undertake problems limited only by the appropriations allotted the Department.

THE NORTH CAROLINA STATE ASSOCIATION FOR THE PREVENTION OF TUBERCULOSIS† held a most helpful and successful meeting in Charlotte, N.C., Jan. 12, 13, 1909. There were thirty-eight papers on the program, most of which were read.

* Bulletin California State Board of Health, December, 1908.

† Bulletin North Carolina State Board of Health, January, 1909.

Through the courtesy of Dr. Register of the *Charlotte Medical Journal*, the entire proceedings will be printed in a special edition of that periodical.

A KANSAS STATE ASSOCIATION FOR THE STUDY AND PREVENTION OF TUBERCULOSIS was organized Dec. 3, 1908, at a meeting called by Governor Hoch in Topeka.

THE NORTH DAKOTA STATE BOARD OF HEALTH BULLETIN, in its new and enlarged form, is a welcome addition to public health literature. The good accomplished by these educational bulletins cannot be overestimated.

Volume I, No. 1, November, 1908, takes up the crusade against tuberculosis. No. 2, January, 1909, is principally devoted to school hygiene.

Concerning North Dakota, we are pleased to make the following quotation from an editorial by Dr. Grassick in the latest bulletin:

"North Dakota has now reached that stage in its development when it must take its place alongside of the older States in every thing that pertains to its material progress It is no longer on the western border of civilization, but right in the center of the most enlightened section of our country. Its soil has been so productive that it has earned the title of "the breadbasket of the world." Its institutions of learning are turning out scholars that are winning laurels when pitted against the graduates of eastern schools. Our citizenship is of as high a grade, morally, intellectually and physically as that of any State in the Union; and it only remains for us to fill in some of the gaps to make us a model of Statehood."

BOOK REVIEWS

The Systematic Relationships of the Coccaceae with a Discussion of the Principles of Bacterial Classification. By CHARLES-EDWARD AMORY WINSLOW AND ANNE ROGERS WINSLOW. *New York, John Wiley & Sons*, 1908.

In spite of the attempts of the Committee on Standard Methods of the American Public Health Association to secure uniformity in all our bacteriological procedures, and in spite of the chart proposed by the Society of American Bacteriologists for the uniform description of bacterial species, the bacteria continue to vary, and we have been unable, therefore, to arrive at a scheme of classification which shall be anything more than an artificial grouping for convenience in identification.

But with the publication of this book of the Winslows we see the dawn of a new era in bacteriological classification, and we have hope that soon we may see a scheme of classification worked out which shall be something more than a plan to enable us to determine whether a species has been described in the literature, one which shall express the real relationships of the different forms and tell us something of the paths along which bacterial evolution has taken place.

All the earlier schemes of classification have been artificial and arbitrary. They have not expressed natural relationships. The few groups which have been based on morphological characteristics, such as the cocci, the bacilli, and the spirilla, may represent natural families or genera; but in the further subdivision of these groups, where the criteria of classification are physiological characters, all

semblance to a natural classification is lost and we find only bewildering confusion.

This is but natural when we consider how variable and uncertain most physiological characters are. Further, we have no precedent for making use of physiological characters for classification, even among the higher plants and animals. We can never hope, however, to get a satisfactory classification of the bacteria based on morphological characters alone. Organisms which resemble one another so closely morphologically, while so widely different physiologically, must, of necessity, be classified by their physiological characters. At first classification based on physiological characters seems hopeless, particularly if our classification is to be a natural one and express real relationships between the forms placed together, as every real classification should. That such a classification is not out of our reach, however, is made evident by the work before us. The principle which the authors of this book bring to our attention is by far the most important contribution to the purely-scientific side of bacteriology which has appeared in a long time.

Their method of defining bacterial groups is by the study of the numerical frequency of different characters in a large series of cultures. This is not a new method. It has been used for some time by anthropologists and students of variation and heredity. Indeed, while the work of the Winslows was going on, there appeared a paper by the English workers, Andrewes and Horder, on the classification of the streptococci, which they had worked out by this method. But, whether old or new, it is to the credit of the authors of the present volume that they have appreciated its value, and have applied it on a large scale to the whole problem of bacterial classification.

This method of biometry depends on the fact that fluctuating variations, when measured in a considerable number of individuals, group themselves in a curve, which follows the simple mathematical laws of chance. These curves

are identical for any group of individuals of the same origin. But if they are from different origins the shape of the curves will differ as well as the position and height of their modes. While particular members of two groups may be indistinguishable, the two groups will be sharply differentiated by the characters of their curves. Further than this the statistical method will serve to indicate the relationship of the different groups if the observations are extended to the correlation of different characters.

To quote the authors' own words: "The biometric methods, which have proved so useful in the study of the races of man, promise to be of even greater value in the systematic analysis of types among bacteria, where so many factors combine to preserve varietal differences on so wide a scale. If individual strains only are considered an infinite series of differences appear. If the same strains are considered statistically, that is, if the frequency of a given character be taken into account, it is apparent that certain combinations of characters are more common than others. Measurement of almost any character by quantitative methods shows that the bacteria examined group themselves on a simple or complex curve of frequency. The modes of this curve indicate centers of variation about which the individuals fluctuate; and these centers of variation are the real systematic units of the group. The recognition of such centers, as specific types, offers the natural and satisfactory compromise between systematic multiplicity and vague generalization. The grouping of specific types is an even more important problem than the definition of the types themselves; and here the correlation data obtained by biometric study are of assistance. A true, natural classification is tree-like, and includes branches and twigs of varying grades of importance. Genera of bacteria should be aggregates of those specific types which are most nearly related; and the basis of the relationship will differ in each individual case. . . . Finally the results may be analyzed with two ends in view. First, each center of numerical

frequency, marking a group of organisms varying about a distinct type in regard to a single definite property, may be recognized as a species. Second, those species which are bound together by the possession of a number of similar properties may be constituted as genera, and larger groups of genera, still characterized by some characters in common, may receive the rank of families or subfamilies."

We have no doubt that the application of this principle to bacterial classification will give us a sound foundation upon which to build our systematic groups. It will give us a natural system of classification which will indicate to us the probable relationships of the different groups. It is true we shall have to revise our nomenclature but, on the whole, this will be of advantage. The present method of having large and unwieldy genera has made it frequently necessary to use trinomial and quadrinomial names to distinguish species. If we can abandon such enormous genera as micrococcus and bacillus, and make use of definite smaller groups of generic value, even though these are based on physiological characters, it will certainly be an advantage.

As a practical illustration of how to apply this principle to classification the authors have given us a most complete and careful study of the natural groups of the Coccaceae. They have submitted some 500 strains of cocci from different sources to a series of definite tests, have plotted the frequency curves for these characters, studied the correlation of these characters, and have taken the modes of the frequency curves as the bases for the establishment of the different groups.

The characters which they selected for this study were as follows: 1, Habitat; 2, Grouping of cells and dimensions; 3, Relation to Gram's stain; 4, Vigor of surface growth on agar streak after fourteen days at 20°; 5, Amount of acid produced in two per cent dextrose broth after fourteen days at 20°; 6, Amount of acid produced in two per cent lactose broth under the same conditions as under 5; 7, Formation of

nitrates in nitrate solution; 8, Formation of free ammonia in nitrate solution; 9, Comparative growth and color production after fourteen days on agar streak at 20° and 37°, respectively; 10, Chromogenesis; 11, Depth in cm. of gelatin liquefaction in tube of 10 mm. diameter after thirty days at 20°.

We may at first be somewhat surprised at the particular characters chosen, but in every case the evidence upon which the choice is based is given, and we can but agree with the authors that the eleven tests chosen are sufficient to enable them to recognize the most important natural groups.

A further study of the correlation of these eleven characteristics shows that the groups selected are marked by a general association of a number of independent characters, and this fact can only be explained, our authors say, by the natural relationship of the groups.

The groups marked out by the authors are as follows: Family, Coccaceae; Subfamily, Paracoccaceae; Genera, Diplococcus, Ascococcus, Streptococcus, Aurococcus, Albococcus, Subfamily, Metacoccaceae; Genera, Micrococcus, Sarcina. Rhodococcus. This gives us eight genera among the Coccaceae, each of which, undoubtedly, represents a natural group, and the arrangement of these groups in the subfamilies gives us an insight into their natural relationship and probable line of descent.

In looking over this arrangement we are struck by several entirely new ideas. First we notice the great importance placed upon pigment production. We have been led to think in the past that this character is an exceedingly variable one and of little systematic importance. But a study of chromogenesis by the biometric method shows that the production of the various pigments is the property of certain well-defined types, that it is correlated with many other physiological characters, and that it therefore must be of genetic significance. Again we find the authors laying little stress on the shape and markings of colonies on agar or gelatin, or the shape of the liquefaction in the gelatin stab, all of them

characters to which previous systematists have given considerable weight. Our authors point out that these characters are but the result of differences in the vigor of growth, the solidity of the gelatin, the presence or absence of moisture, etc.; but they are careful to state, however, that in other groups these same characters may be of greater value.

After the general discussion of the principles of bacterial classification and the presentation of the results of their study of the Coccaceae, the authors give us a summary of the genera and species of the Coccaceae in a form for easy reference, and then a well-arranged key to these genera and species, and finally a complete bibliography and author and subject index.

We have in this fine piece of work then, two very valuable contributions to the science of bacteriology for which to thank our authors. First, the suggestion of a new principle by which we may derive a natural classification of the bacteria, even though we must use the exceedingly variable physiological characters, and second, a very valuable illustration of the application of this principle to the classification of the Coccaceae. We can but praise the thorough way in which the work has been carried out and the admirable clear and comprehensive way in which it has been presented to us. We hope that the excellent example set by these authors will be followed by workers in other lines, and that we shall see the biometric method mapping out for us the real relationships of the other groups of bacteria. A long series of monographs of other groups worked out on the lines suggested in this book will be the greatest compliment which bacteriologists can pay to the work of these authors.

F. P. GORHAM.

Chemical and Biological Survey of the Waters of Illinois. By EDWARD BARTOW, Director. *Report from Sept.* 1, 1906, *to Dec.* 31, 1907.

This bulletin contains a report of the work of the Illinois

Water Survey from its inception to Dec. 31, 1907, together with a number of papers prepared by members of the staff of the survey, and concerning problems incidental to its routine work.

The main report consists of a description of the work accomplished during the sixteen months ending Dec. 31, 1907.

The report divides the waters of Illinois into three general classes, viz., rain waters, surface waters and ground waters. These are again subdivided according as the water comes from streams, lakes, ponds, or from springs, shallow or deep wells, and wells in rock or drift. Tables show the number of waters of each class examined in each month during 1906 and 1907.

Analyses of shallow wells predominate, while those of surface waters are next in number. Deep drift and deep rock wells have been examined in almost equal number, and samples from springs form the next largest group of analyses.

Sixty per cent of all waters received were condemned, the deep wells being by far the most acceptable sources of supply, for only thirteen (13) per cent of the waters from this source were open to suspicion.

The results of an investigation of manufacturing wastes, which comprised gas, sugar house and acid iron wastes, contains much statistical matter and many instructive tables.

The following methods of disposal were considered: 1, Dilution; 2, Clarification in Sedimentation tanks followed by filtration; 3, Evaporation; 4, Chemical treatment. Methods 1, 3 and 4 were carried out on the final waste product from the Corn Refining Company's plant.

The report contains a very valuable and interesting chapter on "Interpretation of Results," which throws additional light on the meaning of the ordinary sanitary analysis of western waters, and also suggests limits of impurities.

There is a report, also, of an investigation of the waters of Normal, Ill.

Three papers are reprinted, viz., "Sanitary Chemical Examination of Water Bacteria," by A. W. Sellards, *Journal of Infectious Diseases*, 1907, supplement No. 3, pp. 41–49. "Laboratory Experiments in Water Treatment," by Edward Bartow and J. M. Lindgren, *Journal American Chemical Society*, volume XXIV, page 1,293. "Normal Waters of Illinois," read before Laboratory Section of the American Public Health Association at Atlantic City, Sept. 30, 1907.

The report contains much valuable data, and will be of interest to all connected with sanitary work.

C. F. LONG.

The Electrical Conductivity of Natural Waters with Special Reference to its Practical Application in Water Analysis. By Dr. H. Stooff. *Gesundheits ingenieur, January*, 1909.

The author proposes a determination of electrical conductivity as a method for determining the potability of water, especially as regards contamination by organic matter and mineral salts. He states that the electrical conductivity method has been extensively used in Germany in studying waterworks problems, especially where it is a question of supplies from both surface and ground sources.

The main features of the theory of electrical conductivity in dilute solution are first set forth, followed by a discussion of the application of theory to practice. Most of the salts present in natural waters are highly dissociated. Carbonic acid is not, but its salts are strong electrolytes.

Conductivity measurements are effected in the usual manner, with due regard to temperature. Ordinarily a correction for temperature must be applied.

The electrical conductivity of natural waters varies between 6.10^{-2}. and 6.10^{-8}. Chemically pure water shows a conductivity of $0.04.10^{-6}$.

A conductivity determination is available for determining

the approximate quantity of mineral salts, since there is a fairly constant relation between the mass of the combined electrolytes and the conductivity. The author develops the necessary factor.

This method is very rapid, is especially available for detecting changes in the composition of water, whether pollution by surface water, by sewage or by harder ground waters. The method is readily adapted to field uses. A portable outfit is described. Experiences at the Royal Prussian Testing Institute at Berlin have shown that the method is exceedingly useful as a rapid means for determining the quality of water. It is not intended to replace chemical and bacterial tests, but rather to supplement the information usually so secured by indicating directly any abnormal features of a given water.

A. ELLIOTT KIMBERLY.

A Text-Book of General Bacteriology. By EDWIN O. JORDAN, PH.D. *W. B. Saunders Company, Philadelphia*, 1908. Price $3.00.

The author of this work has produced a general bacteriology worthy of more than passing comment. He has succeeded particularly well in a most difficult task, namely, the production of a book which, while sufficiently elemental for the beginner, is nevertheless very readable and instructive to the advanced student, and at the same time of some value as a reference work.

As is, perhaps, to be expected from the relative importance, the last three-quarters of the book is devoted to pathogenic organisms; the first quarter being devoted to a lucid explanation of bacterial methods, the effect of physical and chemical agents, bacterial products and the classification of bacteria.

About forty pages are devoted exclusively to a discussion of immunity handled in a manner which is calculated to give the beginner a fair insight into a somewhat abstruse subject.

Following immunity are chapters on the various pathogenic organisms logically grouped, and finally chapters bearing on the bacteriology of milk, air, water, soil, etc.; one chapter on industrial bacteriology, one on the disease of plants, and finally an appendix dealing with the infectious diseases of unknown causation.

Practically all of the latest advances in the science are discussed at length, both sides of mooted questions given a fair bearing, but usually with no attempt on the part of the author to settle the controversy. As a rule conclusions are logical and not overdrawn.

It is with a feeling of relief that one notices the absence of the time-honored illustrations which have been copied from one bacteriology into another. One familiar cut still confronts us, — that of the nearly obsolete vertical autoclave, with its multiple clamps. The illustrations are as a rule good, though one is inclined to wonder occasionally how much help the average reproductions of photomicrographs are to the student. Especially does this come to mind when *Bacillus mallei* has all the earmarks of *B. diphtheriæ* (p. 363). Nor is it of any special advantage to show a culture of *B. diphtheriæ* twice (pp. 228, 229).

Taken as a whole there is but little to criticise. On some points differences of opinion might arise as to the advisability of certain procedures. For example, while cover glass preparations (page 44) are exceedingly valuable to the student, they are a source of annoyance and loss of time to the routine worker and serve no very good purpose, since a slide smear will answer as well.

In staining the tubercle bacillus (page 46) one is advised to boil the stain over a free flame thirty seconds. In the hands of others this technique often results in raising the smear in places from the glass; gentle heating serves the purpose of fixing the stain and does no damage. On page 47 we are told that flagella are easily broken off, despite Hill's experiments (*Journal of Medical Research*, new series, Vol. VIII., page 97),

in shaking bacilli for many minutes vigorously without harm to the flagella.

On page 63 the following statement occurs: "A noteworthy correlation of characters is shown in the almost unfailing association of spore formation with a strictly anaerobic habit of life." Since the sentence following this refers to the single spore bearing aerobe pathogenic to man (anthrax) it is probable that the sentence quoted was written with pathogens alone in mind, but the statement as it now stands is open to serious question.

The editorial training of the author is shown in the almost total lack of typographical errors, but one—a double dagger, p. 168, for an asterisk,—being noticed in reviewing. In public health work, including diagnostic bacteriology, the author shows an excellent grasp of the subject, his statements being clear and conservative. Could one statement regarding typhoid fever be impressed on the inhabitants of those cities who feel that it is better to drink dilute sewage and pay occasional undertakers' fees than it is to put money into filtration plants, much good might result: "The number of deaths reported indicates that there are, at least, 350,000 cases of typhoid fever in a single year in a population of about 76,000,000, and that in the course of a decade, perhaps, one person in every twenty or twenty-five contracts typhoid fever. *These cases are caused by taking into the mouth germs dis charged in human urine and feces, and the conditions that make this possible do not imply that a very advanced state of civilization has been reached.*" (Page 267, italics ours.)

In the chapter on glanders (page 367) the statement is made that the guinea pig reaction is not absolutely specific, since analogous orchitis may be occasioned by other organisms, and the impression is given that the reaction is one to fall back on when other tests fail. This would, indeed, be true were one to trust to the lesions without cultures therefrom. In the hands of the experienced worker a mistake is an impossibility if guinea pig *and* culture are absolutely typical. Some

statement should have been made that *B. pyocyaneus* gives a somewhat similar, but easily distinguishable growth on potato, and may produce a somewhat similar but less complete orchitis in the pig.

In the chapter on milk no reference is made to the excellent work of J. O. Jordan in tracing out diseased cows from the results of streptococci and pus examinations in milk, although the value of such examinations is discussed and other results mentioned.

The criticisms above made should in no way give the impression that the book is other than of the highest class, written by a man who knows his subject, and knows how to present it.

B. R. RICKARDS.

PAMPHLETS RECEIVED

Bacterial Associations in the Souring of Milk. C. E. MARSHALL and BELL FARRAND, *Michigan State Agricultural Experiment Station.*

Keeping Qualities of Butter. W. S. SAYER, O. RAHN, B. FARRAND, *Michigan State Agriculture Experiment Station.*

ADVERTISEMENTS.

Any subscriber, or member of either of the Associations which we represent, who is seeking employment in hygienic lines of work, or who is on the outlook for persons so trained, may insert on this page an advertisement to that effect free of charge for three successive issues.

Replies to advertisements sent "care American Journal of Public Hygiene," *should be directed to the Journal, Box* 2,015, *Columbus, O.*

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WANTED. Position by a chemist, B.S. Have a thorough knowledge of bacteriology, experienced in hygienic work, including work on water and sewage. Can furnish the best of references. Address "Sewage," care American Journal of Public Hygiene.

WANTED

BACTERIOLOGIST WANTED. State Board of Health of middle western State wishes young physician, or science or arts graduate, to take charge of laboratory. Must be thoroughly qualified in diagnosis of communicable diseases and in milk and water bacteriology, and capable of making original research. Prefer one of literary ability. Excellent opportunity for active, capable man. Salary, $125 per month. Address in typewriting, stating experience in full, particularly in the line of water bacteriology. Address E., care American Journal of Public Hygiene.

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EDITORIALS

EDITOR'S NOTE.—The subject of the systematic training of public health officers has been very prominent recently. We have secured in the following three editorials expressions of opinion from a practising sanitary engineer, from a state official and from a physician who combines in himself the functions in part of a deputy state officer, in part of a municipal officer, and in part of a county health officer. All three are men whose peculiar opportunities for the observation of public health matters from their several standpoints have been wide and intimate. Whether our readers agree with these views or not, they cannot help appreciating the sincerity with which they are made, or escape the forcible impression that an evident and immediate need exists for the adoption by professional hygienists of some pretty definite policy with regard to the future development of their own profession.

PUBLIC HEALTH—A NEW PROFESSION

It is apparent to many that the time is ripe for the evolution of another profession, namely, that of public health, a profession which will embody in it some of the elements of several other professions, elements which must be recapitulated under the heading of public health, something more than sanitary engineering on the one hand, something more than mere preventive medicine on the other.

The first professional man was the priest. He was priest, physician, lawyer, and engineer all in one. Moses is the familiar example of the trinity of the old professions, and the "Pontifex Maximus," or the head of the priesthood of pagan Rome, was at the same time the Chief Builder of Bridges as the name implies. One by one medicine, law, architecture, and engineering became separated from the priesthood and in this century many new specializations have arisen until the differentiation has become bewildering in its complexity. However, this specialization is in accordance with the spirit of the age and in that spirit must the future be faced.

The public health work to be done in new communities consists largely of sanitary engineering, while in communities more advanced, whose water supplies, sewerage systems and other items of municipal housekeeping are above criticism, the work is largely in the field of hygiene and sanitation, including the minimizing of contact infection and the house to house instruction of the ignorant and careless in the laws of personal hygiene and cleanliness.

At present the training in public hygiene given to the physician in the average medical school amounts to about thirty hours during the course, while in at least one non-medical technical school the sanitary engineering students have sev-

eral times as many hours of instruction designed to fit them for service in the field of public hygiene.

Notwithstanding his defective training the public reasons that, whereas the physician has to do with disease, therefore he is more competent to deal with problems of public health than any other class of professional men. Therefore it happens that a man with a doctor's degree, regardless of his training, has a better hold on the public than any engineer or sanitary expert, no matter how well trained.

It is the common belief of those best informed regarding public health matters that the work in America will follow two lines, namely, medical and sanitary; *i. e.,* personal and environmental; that the training of the physician fits him better to undertake the former, and the training of the engineer makes him better fitted to undertake the latter work, provided both have enough further training to enable them to consider the problems from a social rather than an individualistic standpoint.

While public health work will probably divide itself broadly along these lines, the smaller cities and all rural districts may have to depend upon one man who in his early professional life is well enough trained in both of these general branches of the work to satisfy all the requirements to a reasonable degree. This of course would mean the placing of the work, in the rural districts at least, in charge of the State, and in order to get the right kind of men, the promotion of the workers from lower to higher positions would have to follow, just as the mayors in Germany are promoted from village to town and city.

All conscientious public health workers realize how imperfect conditions are. One distinguished magazine writer has stated that only a quarter of our public health officials are conversant with their work. The rest are ornamental, and a distinguished visiting German sanitary officer writes, "How corrupt the conditions are in the city boards of health of the

United States may be realized from the fact that the meaning of the expression 'medical politician' is very familiar."

It is obvious that public health work can be carried on best by one trained especially for it. The average medical graduate is ignorant of the statistical method of study and the practical methods of public sanitation. The average sanitary engineer has little or no knowledge of disease and no doctor's degree. It does not seem at all feasible to teach enough of public hygiene within a four years' medical course to be of much practical value to a man who is going into public health work, nor enough medicine during a sanitary engineer's course to enable him to become a satisfactory health officer. The problems of water supply, sewage disposal, contagion and quarantine, and the whole subject of epidemiology cannot be taught without actual contact with the work any more than can medical diagnosis, and extremely superficial work must be performed by some health officers and inspectors who have not had what may be termed a thorough laboratory training in the chemistry, physics and biology of man's environment, a knowledge of the statistical method of study and investigation and some actual observations of public health work as it is carried on in practice. It might be argued that the training in hygiene which is given to the physician would be the best foundation for public health work. The fact is, however, that the subject is not popular with medical students and the laboratory method is seldom used as an aim to teaching this subject. It happens, therefore, that the average medical graduate is woefully deficient in the principles of even ordinary personal hygiene, to say nothing of public hygiene. Nor is this surprising. The other subjects are more interesting and more fundamental to medical practice. Is it not too much to expect of the practising physician that he be expert concerning matters which lie outside of his routine practice? Is it not enough to expect that he be the teacher of personal hygiene in the

home in place of the army of faddists and fakirs who now in too many cases perform that function? It would seem that more good could be done by increasing the instruction in personal hygiene and preventive medical treatment, during the four years' medical course, and by leaving the instruction in public hygiene for after graduation.

The problem is to fill the deficiencies in the training of a medical graduate or of a graduate in sanitary engineering or applied science in order that he may be competent in his early years to accept minor positions and perhaps in later years to grow into the more important ones, specializing as he grows older along the lines of his early professional training, medical or engineering, or in a few cases of pre-eminent ability, taking charge of the general executive work of the State and Government. With a career of this kind open to him, the man who is primarily an engineer and the man who is primarily a physician could equally well afford to devote themselves sedulously to Public Hygiene as a life work, and the demoralizing habit of regarding such work as a mere temporary stepping-stone to reputation leading to successful private practice of engineering or medicine, would disappear.

To suggest a course for the training of a Public Hygienist is difficult. The training which could be given in the immediate future would necessarily fall short of the ideal. It might be well, however, to set up a pattern to grow to. The work of the Public Hygienist is the refinement of our material civilization. Therefore, every study which has a social value would contribute to the general result.

The general preparatory work should include Mathematics, the languages, especially English, German, and perhaps Latin and Spanish. It should also include Economics, History and Sociology. Since the study of public hygiene, as Professor Sedgwick expresses it, is nothing more or less than the study of "Physic, Chemistry and Biology of our environment," it follows that these subjects should be thoroughly

taught to the embryonic sanitarian. Furthermore, they should be taught by the laboratory method. The Biology should include Botany and Zoology, and the Chemistry, qualitative and quantitative analysis and the chemistry of air, water, and municipal and factory wastes.

Graduates in general science or engineering should be obliged to take courses in elementary Anatomy, Histology and Physiology, and a special course in Medicine with due reference to the diagnosis and etiology of contagious diseases. Graduates in Medicine should be obliged to take courses in elementary surveying and mapping, including drawing and plotting, also elementary hydraulics and sanitary engineering.

The main professional subjects should include Bacteriology and Parasitology, the methods of defence against the microorganisms of disease in general, Sanitary Biology, Sanitary Science, Sanitary Engineering, Sanitary Law and Hygiene. The last should include sexual and tropical hygiene and the hygiene of schools, ships and other structures. Where possible all of these courses should be taught by the laboratory methods and visits to public institutions like hospitals, quarantine stations, dairies, schools, etc. For some students special courses in Pathology, Autopsy work, Architecture, Structural Engineering, the Chemistry of foods, Toxicology, Physiological Chemistry and Geology should be given by experts, but the training in the main should rest upon the three fundamentals, namely, Physics, Chemistry and Biology.

For his doctor's degree the candidate should present a thesis which should embody the results of some original investigation which should reveal an ability to attack public health problems in a scientific way.

It is obvious that no institution except a university with medical, engineering and science departments could hope to start courses along these lines with any sureness of success. The graduates should have the degree of "Doctor in Public

Health" or "Public Hygiene." This course would remove the disadvantage under which the well-trained non-medical sanitary expert works at present because of his lack of a doctor's degree, and would remove that under which the medical graduate labors because of his lack of statistical and sociological methods of study and work and his ignorance of engineering. Such a school would have to be conducted for some time before it could rely upon its students for support. At present, however, the supply of well-trained men does not equal the demand. It is gratifying that good beginnings have been made at the Masachusetts Institute of Technology, at the University of Toronto, at Cornell, at Columbia, and at other places, and it is to be hoped that more and broader courses will be offered in the future. Better training for the health officers would be followed by a greater appreciation of their work on the part of the community, also better pay. If broadly trained men were in control of our public health work the misunderstandings which might arise between narrow-minded constructing engineers without knowledge of public hygiene on the one hand, and hygienists deficient in the knowledge of sanitary engineering, yet provided with the power of initiating public sanitary works on the other, would be obviated. The attainment of this ideal is afar off, but it is well worth hoping and working for.

R. S. WESTON.

TRAINING FOR PUBLIC HEALTH SERVICE

No one seriously questions the need for better preparation on the part of the majority of those engaged or seeking opportunities in public health service, whether federal, state, or municipal.

No one entertains any serious doubts of the ultimate inauguration of some plan whereby theoretical and practical instruction in the technical and in the administrative branches of public health service will be made available for the beginners. the recent graduates, and for those already engaged in such service.

The question to be discussed here is, what can be done in the immediate future for the training of the members of these three groups, and upon what basis and by whom should it be undertaken?

It would seem logical to consider the needs of the hour under three heads:—

First: The further training of the existing forces, that is, those already experienced in the practice of the service.

Second: The training of the beginners, that is, those who could take advantage of opportunities to specialize in some of the undergraduate courses in educational institutions, which should lead to a comprehensive graduate training in public hygiene.

Third: The further training of these and others, for teaching and professional work in public hygiene through comprehensive and systematic graduate work leading to a degree in public hygiene, or its equivalent.

Those designated in the first group are relatively experienced in the professional practice of public health, but are generally proportionately deficient in theoretical and tech-

nical training in the fundamental sciences upon which efficient work should rest.

In their instruction it would seem logical to apply our educational efforts by starting from the standpoint of everyday practice and working into the fields of theory and principle. By so doing we are working from the known to the unknown. For the successful conduct of this plan, it would seem to be absolutely imperative that the instruction be given under the direction of, or better, by those who have had a large measure of practical experience in public health work, and who are in close touch with its everyday problems; but who have had, as well, a fair measure of systematic training in the necessary fundamental technical sciences and their application to public health work. If they have also been trained in the science and art of pedagogy, all elements for success will be available.

To make general application of this plan: The courses for health officers should be under the direction of official departments, and taught by their staffs, or under their immediate supervision. This is to insure starting from the practical standpoint. The courses to be attractive, however, must give instruction in the technical operations and fundamental principles upon which actual practice is founded, and this should be given by the experimental method, so far as time permits. To offer courses in public health for health officers of experience, to be conducted by young instructors or assistants of educational institutions, in the departments of bacteriology, pathology, chemistry, physiology, clinical medical diagnosis, various branches of engineering, law, sociology, statistics, etc., is to invite a termination of the subject after the first series of lectures or laboratory exercises, if not before. Even the enlistment of the services of a corps of eminent professors, but who are without experience in the application of their knowledge to practical public health problems, will not greatly enhance the value of the courses, and, therefore, their attraction for the average health officer will be small.

On the other hand, the conduct of the courses by those who have had little or no training in the branches of science of fundamental importance for successful public health work, no matter how experienced they may be in the practice of public hygiene, may result in examples of the blind leading the blind, and no real progress will be attained.

The best hope for the success of such strictly postgraduate courses lies in the utilization of the comparatively small number of workers at present engaged in public health service, who have had training to a greater or less degree, in the fundamental branches of science which have been mentioned, and have likewise come in contact with practical problems, and through the attempts at their solution have obtained actual experience in public health work.

If we should limit our instructors to those in this group who have had experience in teaching these subjects, the number available would be small indeed. In this paucity of the proper teachers lies one of the chief reasons for the lack of development in this field of educational effort in public hygiene.

The existence of so few of such courses is probably not, as is generally supposed, due to lack of willingness on the part of health officers of municipalities to attend and profit by them. The marked enthusiasm shown by those who have attended the few courses which have been given in the laboratories of the New York State Department of Health, has convinced the writer of the great desire of large numbers of health officers to obtain further training and their willingness to make considerable personal sacrifices to attend short practical courses, given by men possessing both technical knowledge and practical experience.

It would seem to be the function of the state to project and support such educational efforts, under the direction of state boards, or departments of health. However, for ease and a great success in their conduct, co-operation with some educa-

tional institution is most advantageous. Where the facilities of a state university, college, or well equipped normal school can be utilized, and the assistance of members of their faculties can be obtained for the preparatory efforts, then a greater measure of success may be confidently expected. However, actual work in the official offices and laboratories is essential for the final instruction.

The chief requirements are, brevity of the course to secure the economical use of the time and resources of the health officer, and the development of the instruction from the standpoint of public health practice towards the principles and theories upon which that practice rests.

It is doubtful if the inauguration of such courses in connection with the branches of the federal bureaus or services, would be successful in attracting the health officers or health officials of small municipalities. These federal departments are not in close touch with the majority of municipal or local problems, and have no everyday association with them. Their officers do not possess, therefore, the qualifications as to practical experience which we have outlined as essential for the instructors in this field.

The federal departments might, however, to the very greatest advantage, become the leading spirits in the development and improvement of the various branches of work engaged in by the state boards and departments, by educational measures such as conferences, courses, etc. They might be, and they are, to some extent, the leaders in scientific research in fundamental problems, in the development of standard methods, in the promotion of uniformity of interpretation of results, and especially in the unification of the legislative and administrative activities in the separate states.

In other words, theirs should be the higher educational field, contributing results to be utilized by the state offices in educational efforts for the betterment of their own and the municipal health services.

The second field of educational action in public hygiene, namely, with the beginners, has been most admirably dealt with in the preceding editorial, and need not be considered here in any detail.

In principle, the instruction will be by induction based upon the experimental method. Those giving the instruction probably will not, and it should hardly be required that they be, experienced in the practice of public hygiene. It will be sufficient that they be familiar with the principles of the subject. In those universities or large institutes where graduate work as outlined under group three is conducted, the instruction for the beginners should be under the supervision, or at least the instructors should be guided in the scope and method of their teaching, by those in charge of the graduate courses.

The third field of educational effort toward efficient public health service has likewise been carefully and amply considered as to its scope and general direction by Mr. Weston. It will be sufficient here to emphasize the almost paramount necessity for a large measure of actual practical experience in public health work, on the part not only of the director of the course, but also of the heads of the important departments giving the graduate or advanced instruction in those branches of the natural, medical, legal, engineering and sociological sciences, which should make up this full course of study leading to a degree in public health.

It might be said that the practice of public hygiene requires not only the utilization of all facts of the natural sciences, but also the application of all the principles and methods of the science, and the art of the utilization of that knowledge. Instruction and training for its service cannot more logically be given by those deficient in the science and art of utilization, than by those lacking in the knowledge itself. Therefore, the close association or utilization of the official public health and welfare services in the fields of education in public hygiene, especially in the recent graduate and post-

graduate courses, is as essential for success, as the association and utilization of the hospital and dispensary for the training of practitioners of medicine, and of the courts for the successful education of the members of the bar.

Probably nothing would have greater influence in excluding undesirable types of politics and politicians from the public health services, and make for the continuance in office of capable officials, than such close association of official and educational efforts.

On the other hand, doubtless nothing would stimulate more active efforts on the part of the workers in educational institutions towards the solution of many of the, as yet, almost untouched scientific problems of basic importance, than the almost constant facing of such problems by some of them in their official capacities.

If it is not feasible to look, at this time, for official financial support for the development of this plan of cooperation, the educational field in public health will offer vast opportunties for the successful use of contributions from the large resources of privately endowed foundations for the betterment of the conditions of human existence.

While ultimately the development, as well as the practice of public hygiene will be, in all probability, matters for governmental action, the consideration of immediate needs should lead to the utilization of every resource toward th inauguration of systematic work in training for public health service.

The success of the immediate efforts which may be made will be determined, to a very large degree, by the extent of the association of educational endeavor with the actual practice of public hygiene.

HERBERT D. PEASE.

HARMONY IN PUBLIC HEALTH WORK

It is quite apparent, from many points of view, that we are now witnessing a great wave of civic reform; a tendency toward better things; a something which is making the "good enough" of a few years ago, insufficient; and the corrupt, intolerable. A certain social betterment is demanded of the future, and Social Workers, Economists, Lawyers, Engineers, Ministers and Statisticians are all taking their places; they are showing us their equipment, the armaments they are to use and the results to be obtained.

It would seem that this is a fit time for physicians to orientate themselves, so as to take the part in this movement to which their position and attainments entitle them. Not that physicians have been denied that position in the past, for they certainly have been for long the foremost, but rather to retain their leadership in the great new revival and to maintain it by reason of real fitness. First of all it is for us both, physicians and sanitarians, to know our limitations. We must throw off some of our aloofness and work in harmony with all other social agencies for common betterment. It is for us to recognize that we are entitled to speak as experts upon only such things as our education and training justify. In the course offered at the leading medical schools men are trained largely to treat disease in the individual, and usually it is from the point of view of the disease itself rather than from that of the sick human being. Disease in the mass is only hinted at when mentioned, and our best sanitarians have come to feel that the usual medical training does not fit the average man for places of trust in public health work. Yet there are very few medical men who do not feel themselves competent to cope with any and all sanitary problems,

and the public regards their opinions as being as good in these matters as they are in the treatment of a Pott's fracture or a bronchitis. This is manifestly unfair to the really trained sanitarian and a great stumbling block to the public, because from it comes a very great confusion of opinions and of "authoritative" statements.

As a nation we have begun to conserve material wealth. It is as surely coming to be felt, that the health of the public, the efficiency of workers, the "public safety" in brief, is one of the greatest resources we have. As physicians and as sanitarians we feel this keenly. Yet we are liable to greatly overestimate the bearing of disease alone, upon this efficiency. To be sure disease is a very large factor, but in addition disease has as its co-workers, tenement crowding, needlessly dangerous employments, intemperance, immorality, ignorance and many others. Physicians are not trained statisticians, or expert engineers; they are usually not good moralists, and are proverbially poor business men. The contention is that in this great uplift, all possible experts should be working in harmony. But let us as physicians and as sanitarians do some of the harmonizing. We are continually bewailing that fact that we are misunderstood, that governing bodies are niggardly in support, that the public are following fads, and that as individuals we better nurse our grievances in silence. But from the other fellow's point of view, what have we done to show our appreciation of the work of the statisticians, or the man who understands poverty in the abstract? It is time for us to come out of our shells and have heart to heart consultations. Then alone can we be enabled to make in conference a true diagnosis of social ills.

If we fail to do this we will find that the economist, the preacher, the lawyer, or all combined will in the future take the reins and we will be supplanted; we will be made to assume the position with relation to those forces,

which the plumber or painter holds with the general contractor. The average physician is no more entitled to speak with authority upon all maters concerning public health than a photographer is to paint a good landscape.

The time should come when at least central boards of health will recognize this and make use of all the other experts in their respective lines. That medicine should yield the leadership of these "Boards of Public Safety" to any others we can never believe. We feel that the education of the thoroughly equipped medical sanitarian in essential bases of the "Humanities" has been broader and deeper than that of any of the other professions concerned. But to ensure and maintain this leadership, both the physician and the sanitarian must cultivate a very broad point of view.

We have everything to gain and nothing to lose. It is our duty to interpret our particular field to the public. Unless we voluntarily do this the others will be grasping at half truths of medicine and giving them to an eager public in a form so palatable that they will be swallowed whole regardless of their content. For this medication the public has been generously trained by the various "Science" cults. It is probable that what these cults are doing for the banishing of disease, the Socialists and other unsettled enthusiasts are trying to do for economic ills.

E. L. TUOHY.

SPECIAL ARTICLE

NOTES ON THE VOGES AND PROSKAUER (1) RE-ACTION FOR BACILLUS COLI COMMUNIS

By FRANCIS D. WEST

Chemist in Charge Torresdale Laboratory Bureau of Water, City of Philadelphia

Incubate a dextrose culture of the organism for 48 hours at 37 1-2 degrees C., in Smith fermentation tubes for the estimation of the amount of gas produced. Fill the tube with 2 per cent. Na O H solution; close the end with the thumb or better by inserting a rubber stopper. Invert the tube to absorb the C O2 by the Na O H. After the gas absorption is made, the tube is stood aside for 24 or better, 48 hours. (MacConkey 2, 1905.) At the end of this time, certain cultures take on a peculiar coloration, brownish to red, usually only in the open arm, through occasionally the color extends up into the closed arm as well. This color resembles eosin. According to Hardin (3) the substance is acetyl methyl carbinol, and is produced by a certain bacteria that decompose dextrose. Rivas (4) 1908, describes three tests, one of which seems to be the Voges and Proskauer reaction carried out in a somewhat different and shorter way, and one of the others has some bearing on the subject.

They are as follows: "If 1-4 cc. of 48 hr. cultures of various organisms in dextrose broth are rapidly boiled in about 5cc. of a 10 per cent. NaOH solution, there will appear immediately after boiling a yellowish lemon color in the tubes

of Bacillus *coli communis* or in the dextrose control; in others the solution will remain clear and colorless, taking on a pinkish color after five to ten minutes."

The other test is for the presence of sugar. This can be made by adding 1-4 to 1 cc. of the culture to Fehling solution and boiling to reduce the copper.

In the laboratories of the Bureau of Water for the past four years we have been making the V. and P. as one of our routine tests for *coli*. We have never obtained this red reaction with pure cultures of *coli*. Cultures of B. *lactis aerogenes* and B. *cloaceae* give it invariably. More recently we have carried along tests No. 1 and No. 3 of Rivas (4) in connection with the Voges and Proskauer reaction. We note that test No. 1 and the V. and P. reaction are identical. When the V. and P. reaction was obtained, a pink color was shown by test No. 1.

Test No. 1 is more delicate; however, as in the case of the V. and P., the yellow color of the medium often gives rise to a brownish coloration making the reaction indefinite.

We have made the following notes as a result of our work on these tests:

Sterile glucoses on heating with 5 cc. of 10 per cent. NaOH gives a yellow coloration. The depth of the color depends on the amount of glucose present. The sugar is probably caramelized by the NaOH.

Lactose solution becomes yellow to brown, depending on the amount of sugar. Saccharose gives a light yellow color, becoming colorless cold. This corresponds with the Fehling test for sugar. Lactose and dextrose reduce Fehling, while saccharose does not. .0025 per cent. glucose is perceptible by this test. This yellow color disappears on the addition of H_2SO_4, but does not reappear, if alkali is again added in excess.

This "red reaction" (test No. 1 or V. and P.) can take place both in the presence or absence of sugar. In other

words this coloration can take place without all the sugar being fermented. On the other hand, the sugar may be all used up and the red reaction not take place

This red color is discharged by acid (H_2SO_4) and reappears with excess of NaOH. It cannot be extracted with ether, alcohol or xylol. Certain cultures of sewage streptococci and staphylococci, also a culture of a bacillus that gave 3 per cent. gas in Smith in 48 hours, were tested; sugar was absent and the red coloration was obtained, showing that a large per cent. of gas is not necessary to obtain the "red reaction" although cultures of B. *cloaceae,* which usually give 90 to 100 per cent. gas in 48 hours, always give the red color with NaOH.

Some cultures of cocci tested showed the presence of sugar after 48 hours. Sugar was present in cultures of B. *coli* after seven days.

The red color of test No. 1 deepens on standing or by blowing into the tube, showing that the color is probably due to oxidation. This is further shown by the fact that the V. and P. reaction takes place in the open arm of the Smith tube.

In view of the increased importance of the V. and P. reaction, MacConkey (5) has used it as one of the tests used by him in differentiating the members of the Aerogenes Coli group, which work has further been carried out by Bergey and Deehan (6), and which will do much to increase our knowledge of a group of organisms about which too little is now known.

I think that the Rivas improvement on the Voges and Proskauer reaction (though Rivas fails to note the similarity and gives it as an original test) is a test that will prove of value.

If the yellow color appears on heating the culture with 10 per cent. NaOH it will show the presence of sugar. (Rivas test No. 3 being unnecessary). After heating the tube shake well or blow through it to bring the red color out. By this

method, the V. and P. reaction can be obtained in a few minutes without being obliged to wait 48 hours for a color that may be masked in that time by the yellowish tint of the media.

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EDITOR'S NOTE.

At the Winnipeg meeting of the American Public Health Association it was voted by the Publication Committee to make the American Journal of Public Hygiene the official organ of the Association, and to contract for 400 pages, of which 175 were to be devoted to the Association, and 75 pages each to the three Sections. It was also voted to suspend the publication of the annual volume of Transactions, owing to the excessive cost of publishing and distributing the same, and to have the American Journal of Public Hygiene sent free of cost to all members of the Association not in arrears.

But 400 pages were contracted for, owing to the necessity of reducing the amount of money spent for printing to a sum within the resources of the Association. It has therefore become necessary to have papers abstracted for publication.

The Journal is printing the papers in the order and as received from the Publication Committee, and is therefore not responsible for the time of publication, nor for the selection of papers to be abstracted, this duty falling upon the Publication Committee.

AMERICAN PUBLIC HEALTH ASSOCIATION

TYPHOID FEVER IN THE PROVINCE OF MANITOBA WITH SPECIAL REGARD TO THE CITY OF WINNIPEG *

By Drs. R. M. SIMPSON, Chairman Prov.-Board of Health, Manitoba, and A. J. DOUGLAS, M. O. H.

Typhoid fever appears to have existed in Manitoba since the early pioneer days when the country was inhabited by Indians, Half-breeds, Fur-traders, Hudson's Bay men, and a few Colonists.

In the year 1870, the Country was acquired by the Dominion of Canada from the Hudson's Bay Company, and very soon settlers began to arrive to take up land. New material thus became available for the disease, and it became quite prevalent, particularly in what is now the City of Winnipeg. At this time it was popularly known as Red River Fever, and was supposed to be due to peculiar conditions indigenous to the Red River Valley, and to be particularly associated with the drinking of water from the Red and Assiniboine rivers.

Dr. O'Donnell (who was here at that time and is still practicing in Winnipeg) states that the symptoms of this affection were characteristic of typhoid. He also mentions the great number of new arrivals who were attacked, and explains this by saying that the old timers seldom drank raw river water, but always made tea, carrying their pannikins with them wherever they went. The new arrivals had not yet acquired this habit and suffered accordingly.

* Read before the American Public Health Association at Winnipeg, August, 1908

Since the year '72 typhoid fever has never been wholly absent from the community.

In the years '81 and '82 occurred the celebrated Winnipeg boom. A great volume of immigration rushed in. The city underwent a mushroom growth, and, as was to be expected with so many new arrivals unaccustomed to their surroundings, and compelled to live, many of them, in overcrowded and insanitary premises, typhoid fever flourished with renewed vigor, and the number of cases increased proportionately with the population.

The rapid expansion of the city, impelled the City Council to assume the initiative and put the city in a sanitary condition. Previous to this Winnipeg had no sewers, no pavements, and no water-works. Water was hawked about the streets in picturesque but unsanitary two-wheeled carts.

The awakening of the municipal conscience resulted in the establishment of the first sewers of our present system, and, later on, in the inauguration of a public water supply—the latter being under the control of a private company. The company's supply was derived from the Assiniboine river at a point which was then considerably above the settled portion of the city, and was filtered before being pumped into the mains. The watershed of the Assiniboine at this time was sparsely populated; no communities discharged their sewage into it, so it might be classed as a moderately good supply. Its drawbacks were its great turbidity at certain seasons of the year, and its hardness.

A number of public wells were sunk at this time in various parts of the city, and from these a pure water, but very hard, was obtained.

Notwithstanding the installation of a sewerage and water-works system, it was not made compulsory for individuals who had houses already constructed, or who might build new houses, to avail themselves of those improvements, and, consequently, out-houses were in general use. These were of the

primitive earth-pit type, and their contents were removed at intervals and deposited on a dump on the outskirts of the city.

When the inevitable reaction that follows all booms came about, it left the city gasping, as it were, for breath. The installation of improvements languished for a number of years, and the population increased slowly.

In the year 1888, what was designated originally as a dry earth system was put into operation. This led to a gradual extinction of the pits, and in ten years' time but a few hardy survivors of these remained.

In spite of the great things expected of the earth system, it was found to be a matter of the utmost difficulty to carry out its requirements properly in Winnipeg. The boxes were abandoned altogether during the winter months, and privy contents simply reposed on the surface of the ground, and were removed with pick and shovel from time to time.

On the arrival of Spring, the boxes were replaced, and an effort made to carry out the regulations. But bad habits once acquired are difficult to break, and partly on account of people having gotten out of the way of using earth, partly on account of the difficulty of obtaining this, and partly from carelessness, the dry earth feature was gradually eliminated, and there came into being that changling child of the earth system which we in Winnipeg have come to know as the box closet.

This was simplicity itself, and consisted of a more or less water-tight wooden box above the ground, which could be removed and cleansed by opening a hinged flap at the back of the building, and which was used during the Spring, Summer and Autumn. In Winter, closet contents lay on the ground, and were removed with pick and shovel.

It is to the conditions engendered by the presence of large numbers of these box closets that much of our typhoid has been undoubtedly due.

In the late nineties, the Water Company's plant was bought

out, and the water-works became a municipal concern. The river water was found to be unsatisfactory in quality, and an effort was made to improve our supply. On the recommendations of Mr. Hering of New York, and Col. Ruttan, City Engineer, the source selected was a deep well which was sunk on the outskirts of the city, and from which water of a high degree of purity was obtained. Water from this source is in use at the present time, and six other wells have been added to keep up with the growth of the city.

In spite of the fact that our water supply was above suspicion, our typhoid rate rose from year to year, and Winnipeg presented a somewhat anomalous picture of a city with a pure water supply and a high typhoid rate.

Matters continued thus until, in the year 1902, commenced what might be called Winnipeg's second boom.

Winnipeg began to grow by leaps and bounds. So great indeed was this growth that the population doubled in three years.

Again, in an aggravated form, were repeated the experiences of '81 and '82. Houses were constructed rapidly, without improvements, as new areas were built upon. Overcrowding took place in the older quarters of the city, particularly in the unimproved portions. The places where they could live cheapest attracted large numbers of European immigrants, many being from Southern Europe, and their ideas of sanitation were, at best, of the most rudimentary description.

In 1902, population 48,411, there were 356 cases; in 1903, population 56,741, 489 cases; in 1904, population 67,741, 1275 cases; in 1905, population 79,975, 1,906 cases; in 1906, population 101,057, 1,174 cases; and in 1907, population 111,729, 387 cases. This includes cases originating outside the city and coming in for treatment—these run about 20 to 25 per cent. of the total.

When typhoid in 1903 began to take its upward course at

such an alarming rate, we endeavored to get at the reason of this, and if possible, to remedy the conditions responsible for it. One of the most notable features of our Winnipeg typhoid has been its constant relation to season. Prevalence was always slight in all months up to July. When August came the number of cases always increased with a bound. This increase continued throughout September and reached the maximum in this month. In October a diminution was noticeable; November displayed a marked falling off, and, by the end of December, what to us were normal conditions, were practically reached.

There was but one exception to this rule. During the Winter of 1904-5 typhoid prevailed to a considerable extent in one of the best residential section. This outbreak, however, was in all probability due to infected water accidentally gaining entrance into the city mains in a limited area. It thus differed etiologically from the vast majority of cases in the city, and therefore, bore practically no relation to our annual autumnal visitation.

Our investigations showed that not only was seasonal influence very constant, but also that prevalence was almost entirely within certain well-defined areas. These districts were the ones in which unimproved houses abounded, and where box closets were extensively in use.

Separating Winnipeg into two parts, North and South, taking one of our prominent streets, Notre Dame Avenue, as the dividing line, we found in the south district where nearly all houses were furnished with improvements, 549 cases of typhoid in the years '03, '04 and '05. In the north district where box closets dotted the landscape at frequent intervals, during the same period occurred 1,983 cases.

Particularly striking was the fact that as soon as the evenings began to grow cold, that is, in August, and the flies were driven indoors, that the typhoid rate rose, and when the first

hard frosts of Winter set in, and snow fell early in November, that a diminution at once took place.

Box closets offered every possible facility for flies to act as infection carriers, excreta being above ground and entirely accessible, and the light not excluded. It was the commonest thing not only to see flies swarming in these places, but also to see abundant evidence of their actually breeding in them.

In many congested portions of the city, long rows of these closets abutted on a lane; a ditch usually ran alongside of the lane, and, as the closets overhung the ditches, a large proportion of the contents found its way into it. The condition of some of these lanes beggared description.

In addition, in these districts the usual run of houses were unscreened, and, during the warm season, on entering any of these dwellings, one could be certain of encountering an army of flies, and could observe processions of them passing in and out of the doors and windows.

In these parts of the city, with such quantities of potentially infectious material present, to say nothing of the dangers arising from convalescents and walking cases, it can readily be seen what unlimited opportunity existed for the conveyance of the disease. Food, flies and fingers were always active.

Among the foreigners there was the ever present difficulty of getting at the cases. These people, speaking little English, and unaccustomed to our ways, had an ingrained dread of doctors, and would seldom call one until the patient was in extremis.

It was a frequent occurrence to visit houses and find two or three typhoid patients being cared for in one room where the cooking was done and the food kept, the individual who was doing the cooking usually acting in a nursing capacity as well.

Even after the case was discovered, our troubles were by no means ended, for the patient, his family, and his friends

would usually offer strenuous objections to going to the hospital, which they regard as a sort of an experimental vivisection station from which they felt sure that those who entered stood poor chances of ever emerging alive. Forcible removal under the Provisions of the Health Act thus became necessary in these cases.

With typhoid constantly present among the inhabitants of certain districts, we naturally got small outbreaks and odd cases occurring in other parts of the city, sometimes the infection being carried by individuals who worked in one place and lived in another, and often by the agency of milk and other food.

Again, individual cases would occur in the best portion of the city, in which we were quite unable to ascertain the cause.

The situation in brief was: A city with all its inhabitants drawing their water supply from one source; the water being of a high degree of purity; typhoid constantly smouldering in certain unsanitary districts, great outbreaks, taking pdace in these every Autumn and, coincidentally, small outbreaks occurring in other parts of the city which would usually be traced to these perpetual foci, it appeared beyond peradventure, that typhoid would continue to flourish until the whole sanitary aspect of large areas of the city was entirely changed, and infectious material rendered inaccessible. It also appeared certain that flies were probably the most active agents we possessed in disseminating infection. In no other way could we explain the occurrence of so many cases in the months of August, September and October, when all conditions were practically the same as in other months of the year except the presence of myriads of flies.

In 1903 the City Health Department brought this question to the notice of the governing bodies, and suggested that steps be taken to do away with box closets, but, as the outbreak that year subsided quickly with the advent of cold weather, no definite steps were taken.

In 1904 typhoid appeared early in August, and the number of cases quickly increased. The Provincial Board of Health took the matter in hand and discussed the whole situation with the city authorities. The report of the Board was very explicit. The principal recommendation was that the City Council at once get power to abolish box closets, and insist on sewer connection to all houses where such conveniences were available. This was the year in which occurred our Winter outbreak, probably water borne, which caused wide spread discussion and alarm. All sorts of theories to explain this visitation were advanced by professional men and laymen, and finally the Council called in Prof. E. O Jordan of Chicago to investigate conditions and make a report on the typhoid problem.

Mr. Allen Hazen of New York was also called to report on our sewage and water system.

Professor Jordan's report was exhaustive and specific. He recommended that increased power be obtained for the Health Officer for isolation of cases and disinfection of the premises where these occur.

He made a plea for the more prompt notification of cases, and his most important and far-reaching recommendation was that box closets be entirely done away with, and that sewer connection be made compulsory whenever possible; also, that typhoid cases be not allowed to remain in houses which operate an outside closet.

Other suggestions were: Better control of the milk supply, and the doing away with private wells.

The City Council took up the question with vigor, and obtained power from the Legislature, at its next session, to compel sewer connections within a limited area. Box closets were declared a nuisance, and their construction forbidden within the City Limits. We had to face the problem of providing a substitute for these on streets where sewers and water-mains were non-existent, and on those outside the area of compulsory plumbing.

It was decided, after much consideration, that the type of outhouse best suited to our climate conditions, was a water-tight pit, to be constructed of brick laid in cement, with a cement floor six inches thick, three feet in width, and four feet deep, the top of the walls to be carried six inches above the level of the lot.

When this type of closet was first introduced to the public, it met with strenous opposition. All sorts of dire predictions were made as to what would happen if contrivances of this kind were allowed. We were told that the greatest drawback would be that the pits would freeze to the bottom in Winter, and would crack and fall to pieces.

As a matter of fact these prophecies have not come true, and we have found the pit, while far from ideal, about the best compromise on sewer connection that we can get for general use in our climate. The contents but slightly freeze in the Winter, and can be removed all through that season of the year. Also, flies do not go down into the pits in very great numbers, as the interior is dark and the contents almost entirely liquid. Disinfection can be carried out satisfactorily and readily.

In the year 1905, typhoid prevailed to an even greater extent than in 1904, and in this year we reached the maximum number of cases and highest typhoid death-rate. The Council returned to the Legislature and asked for an extension of the area in which to make plumbing compulsory. This request was granted. Power was given to take in all houses in the city on streets where sewer and water existed, and also, what was very important, it was made possible in those instances where people were too poor, or for other reasons unable or unwilling to have the necessary work done at their own expense, for the city to do it and charge the cost as a tax upon the property, spread over a period of seven years.

Brick pits were only allowed on streets where no sewer or water existed.

The crusade was pushed vigorously, and only those who have been through similar experiences can appreciate the difficulties encountered.

At the time operations were commenced against the outhouse, January, 1905, there were in the city (which was much smaller than it is now) 6153 box closets and 189 pits. At the end of the year there were 2,255 box closets, of which 842 were added by the taking into the city of two suburbs. In June, 1907, there were 458, and at the present time there is one box closet in old Winnipeg and about 16 in the new suburbs.

Plumbing has been installed in nearly all these premises, but we have still 1,650 brick pits, these being in localities where sewer and water are not available.

In order to effect this metamorphosis, it was necessary to invoke the aid of the law very many times. We had, altogether, in connection with the installation of these improvements, over 2,000 police court prosecutions.

Hand-in-hand with this branch of the work went more drastic regulations along other lines. No case of typhoid was allowed to remain at home unless the conditions were such that proper isolation could be obtained, and that excreta could be handled in a manner precluding, as far as possible, the chance of infecting others. Rigid disinfection of premises was carried out in all cases.

The use of metal garbage receptacles were insisted upon, also that manure should be kept in covered boxes and removed frequently and regularly to avoid, as much as possible, affording breeding places for flies.

The Provincial Board of Health and the local Department distributed literature on typhoid prophylaxis, and on the care of cases. Circulars were issued instructing people to screen their houses, and to keep down the number of flies by the use of fly paper and other means.

Milkmen were instructed as to what their duties were,

particularly as to the importance of immediately notifying the local Department of illness occurring at any dairy, and penalties were imposed for failure to do this, and a more rigid system of inspection at the places was inaugurated.

It is the practice to disinfect all pit closets at regular intervals with lime solution, and by frequent removal of contents to keep them as clean as possible.

Careful supervision is exercised over the water supply, and a large number of public and private wells have been closed. Low lots were drained or filled in, rubbish heaps were burned or destroyed, lanes paved or graded, many unsanitary premises were closed altogether, and work along these lines is still going on.

Last year some result from our efforts was evident, and, from indications, the present year will exhibit an even more satisfactory showing, as up to the present we have only had 160 cases, which is considerably less than last year's total at the same time.

We recognize, however, that the work here is only beginning, and that it will require unremitting industry to keep abreast with the constantly changing conditions. Many difficulties still confront us, but we hope, with the lessons of the past, to overcome them more swiftly and effectually in the future.

CHARACTERISTICS OF TYPHOID FEVER IN THE MIDDLE WEST *

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The following paper, professing to give the characteristics of typhoid fever in the Middle West, is based entirely upon the records of a single hospital. A word of explanation, if not apology, is therefore necessary. The General Hospital of Winnipeg, Manitoba, was organized in 1872, and incorporated in 1875. Since then it has grown from a capacity of less than forty beds to over three hundred beds at the present time, and has admitted into its wards during that period, over 35,000 patients. Of these no inconsiderable portion has consisted of cases of typhoid fever. About 4,800 cases diagnosed as typhoid fever are on record in the hospital register for the last twenty-six years. Of these about 3,500 were residents of Winnipeg, the remaining 1,300 being resident at various points in Manitoba, Western Ontario, Eastern Saskatchewan, Northern Dakota and Minnesota. In 1883, the Manitoba Medical College was incorporated, and has remained until the present day, the only centre of medical education in Middle Western Canada. Since its inception it has been intimately associated with the Winnipeg General Hospital, its professors supplying the main body of the visiting staff. From its size, therefore, from the large area from which its patients are drawn, from the considerable period over which its records extend, from its intimate relation to a centre of medical education assuring the accuracy and com-

* Read before the American Public Health Association at Winnipeg, August, 1908

pleteness of its records, from its unique position in the largest city in Western Canada, where for many years typhoid fever has been endemic, it may, I think, be legitimately inferred that the records of the General Hospital at Winnipeg should supply material of peculiar value in elucidating the characteristics of typhoid fever in the Middle West.

Early in May of the present year, Dr. Stewart (late of the Hospital interne staff), together with the writer undertook to make a statistical study of all classes of typhoid admitted into the hospital wards since 1882. The records, which consist of the Hospital registers since 1882, temperature charts since 1897, and case reports since 1898, are voluminous, and their analysis is still incomplete. The data to be obtained from the registers, however, have been secured and tabulated for all cases, and 1092 case reports have been inspected and analyzed.

An attempt was made to exclude all doubtful cases, and for various reasons, mainly on account of short stay in the hospital, or lack of important data, about 200 cases have been excluded. There still remain, however, 4,605 cases of which the diagnosis can scarcely be impugned. Based entirely upon the results obtained with respect to these cases, the following facts as to the characteristics of typhoid fever in Western Canada are submitted. It will be seen that reference is made almost entirely to incidence and fatality, it being considered that these phases of the disease are most interesting to the members of the Public Health Association.

The incidence of this disease has been investigated with respect to Sex, Age, Nationality, Season and length of time resident in the country.

Sex: Out of 4,605 cases, 3,530 were males, and 1,075 females. A proportion of somewhat more than three males to one female. During the years, 1882 to 1885, the proportion was seven males to one female. Since then the proportion for any one half decade has been very nearly three to one.

That this ratio is not due entirely to the greater preponderance of males in the Westrn population is shown by the fact that in the census report of Manitoba for 1881, the ratio of males to females is less than seven to five, and in 1901, less than seven to six. That it is not due to a greater susceptibility on the part of the male is indicated by the fact that in children, where exposure to the disease may be assumed to be equal in the two sexs, the incidence is very nearly as one to one. (Out of 407 cases in children of 15 years and under 215 were males and 192 females). That it is due entirely to the greater exposure to the disease on the part of the male seems probable.

In the first ten years of life the ratio of males to females is less than one to one. In the second decade about two to one, in the third decade nearly five to one, in the fourth, three to one and in the fifth, two to one.

Age: Of 4,605 cases of both sexes, the average age is 25.5 years, of the males 26.7 years and females 21.5 years. In spite of the great variation in the population of Winnipeg during the last twenty-five years the average age of typhoid cases has been very constant. The average age of 1,130 patients admitted during the 14 years, 1882-1895 is 25.1 years and of 3,475 cases admitted during the 12 years, 1896-1907, the average age is 25.6 years.

Nationality: In the absence of accurate data as to the population of Manitoba according to nationality, an attempt has been made to compare the number of typhoid cases for each nationality with the total admissions for that nationality. Thus, out of one hundred Swedes and Norwegians admitted for all diseases, twenty-three were admitted for typhoid; out of one hundred native Manitobans admitted for all diseases only seven were admitted for typhoid. Other nationalities, on the same basis of comparison give the following figures: Galicia, 19; Austria, 17; Poland, 14; England, 13; Germany, 12; Scotland, 12; Eastern Canada, 11.5; Iceland, 11; Ireland, 11; Russia, 8.5; United States 8.

Season: The month in which the greatest number of typhoid fever cases develop in Manitoba is undoubtedly September. Of all cases admitted in any one year approximately one-fourth are recorded in that month. If the number of admissions for this disease is plotted for any year or period of years it will be seen that the incidence of typhoid reaches its acme in September, falls sharply during November and then more gradually to its minimum in May. That this peculiar seasonal distribution of cases is not due to any local cause was shown in this series by plotting the dates of admissions of eight hundred and twenty-nine cases treated, during a period of twenty-six years at the Winnipeg General Hospital, but resident at points outside of Winnipeg. These cases came from points scattered over a wide area extending from Kenora and Rainy River on the East, to Moosejaw on the West, and from Saskatoon and Swan River in the North, to North Dakota and Minnesota in the South. The monthly incidence in these cases was observed to correspond very strikingly with the totals in which city cases preponderate.

Length of time in the country: It is a matter of common observation in the West that typhoid is very prevalent amongst recent arrivals. Out of 3,170 cases in which the date of arrival in the province is recorded, 965 or 30 per cent. arrived in the same year as that in which they contracted typhoid, 1,543 or 49 per cent. have been in the province less than two years.

General course of disease: The course and symptoms of this disease do not differ materially from what is already familiar in the East. The typhoid fever patient enters the hospital on an average on the ninth day after the onset of symptoms. The temperature has then in 50 per cent. of cases already reached its maximum. The average of the maximum of 779 cases is 103.8° F. In mild cases which include not less than 13 per cent. of all cases, the temperature now gradually falls to the normal line, reaching it on about

the twentieth day after the onset of symptoms. In cases of moderate severity, which include 53 per cent. of all cases, the temperature remains elevated for a period of eight or nine days, then gradually falls to reach the normal on the twenty-fifth day after the onset. In severe cases which constitute about 34 per cent. of the total, in those which recover the fastigium, is followed by a period about seven days in length, in which marked oscillations of temperature occur, variations of from 106 degrees to 94 degrees in thirty hours, with recovery, being recorded in an extreme case. The temperature now declines gradually towards the normal, reaching it on the thirty-fifth day after the onset. The average duration of fever in 628 cases of all classes was found to be 28.3 days. The average length of stay in the hospital for all cases of both sexes is 37.8 days. The female remains in the hospital, on the average, one day longer than the male.

Complications may add to the length of stay in the hospital considerably. Of forty-five cases in which Phlebitis occurred the average stay in the hospital was fifty-two days. Of fifty-six cases of hemorrhage, fifty days; and of forty-seven cases in which Otitis Media was the only complication, forty-six days.

In connection with the complications recorded in this series of cases, the great frequency of Otitis Media is noteworthy. It is also to be noted that the average age in this complication is below the general average while in heamorrhage and nephritis and the other more serious complications it is distinctly above the general average.

Dr. D. A. Stewart has worked out some important data with reference to 573 fatal cases occurring during twenty-six years. His results are as follows:

In the twenty-six years covered by this report, out of a total of 4,605 cases, 573 ended fatally, a death rate of 12.4. In the earlier years of the hospital, the mortality was very high, reaching 28.3 per cent. for sixty cases in 1884, although

in 1892, it reached the lowest point recorded, 5 per cent. for eighty cases. On the whole it has decreased steadily, and for the past three years the death rate has been 10.8 per cent. The most marked lowering of death rate is from 24 per cent. in 1885, and the four preceding years to 14 per cent. in the four years following 1885. It is significant that this fall of 10 per cent. coincides roughly with the occupation of a new hospital building and consequent better organization, and also with the establishment of a Training School for Nurses.

Sex: This series of cases show a difference in mortality between males and females and while ten cases out of every thirty-two of the total 4,605 were males, ten out of forty fatal cases females. That is, the mortality among males was 12.7 per cent., and among females 11.4 per cent. or 1.3 per cent. less.

Age: Age was found to have a distinct bearing upon mortality. From a death rate of 8.9 per cent. in cases under ten years of age there is a steady rise to 17.6 per cent. in cases above forty years. More in detail the particulars are:

First decade	8.9 per cent.
Second decade	10.7 per cent.
Third decade	11.45 per cent.
Fourth decade	13.53 per cent.
Forty years and over	17.6 per cent.

In another paragraph of this paper it has been shown that liability to the more fatal complications increases as age advances, an observation which may, partially at least, account for a steady rise of death rate with the advance of years.

Nationality: Nationality and race seem not only to affect susceptibility to typhoid infection, but also to bear distinct relations to the severity of the attack. The people who take typhoid most readily, however, are not the ones in whom the death rate is highest. Swedes and Norwegians lead in susceptibility, but Scotland heads the mortality list, followed by Iceland, Poland, England, Germany, Western Canada, Ire-

land, Sweden, United States, Austria, Galicia and Russia, and lowest in the order of mortality, as in the order of susceptibility are the native born of the Province of Manitoba. It is significant that people of the same stock and of similar ways of living, such as Austrians, Galicians and Russians fall into groups with regard to both susceptibility and death rate.

Death rate by months: One of the most striking relations developed in a study of the fatal cases is that between mortality rate and in the seasons of the year. The mortality is high in the Winter and Spring months in which the number of cases is small, and very much lower than the general average in the Summer and Autumn months, July, August, September and October. This is rendered more striking by the fact that in this series a number of light cases reported in the Fall months at the height of epidemics which would tend to accentuate this contrast, were thrown out as of doubtful diagnosis. It may pretty safely be concluded, therefore, that the low death rate for these four months is a real phenomenon.

Time of residence: The remarkable incidence among new comers to a community in which typhoid fever is endemic is parallelled almost exactly by the death rate, the rate being very slightly higher. Among all cases in this series in which the time of arrival is recorded, 30 per cent. were in their first year in the province, and 49 per cent. in the province less than two years, while among fatal cases 33.7 per cent. were in their first year and 51 per cent. in the province less than two years.

In the average of a considerable number of cases, patients came to the hospital for treatment about the end of the first week of the disease. Counting this as the first week, it will be found that death in 573 cases occurred as follows:

Second week of disease	20.6 per cent.
Third week of disease	34.7 per cent.
Fourth week of disease	20.1 per-cent.
Later than the fourth week	24.6 per cent.

The greatest number of deaths occurred on the eighth day in the hospital or about the end of the second week of the disease.

THE DIFFERENTIATION OF OUTBREAKS OF TYPHOID FEVER DUE TO WATER, MILK, FLIES AND CONTACT*

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Gentlemen: When I received the invitation from our Honorable President, Dr. Lewis, to read a paper before this association on the differentiation of Typhoid Fever outbreaks due to infected water, milk, etc., I fully realized my limitations in dealing with the subject. However, I thought that a few observations I had made while investigating in my official capacity several epidemics of Typhoid Fever might be of some interest and perhaps profit to you.

It is a serious reflection upon the people of the United States that, according to the census report for 1900, there were 35,379 deaths in the United States that year from Typhoid Fever—a preventable disease. This loss of life, according to Whipple's calculation, represented money loss to the community of $212,000,000 for that year alone.

The average Typhoid death rate in cities of the United States is about 35 per 100,000. Whipple states that in the cities about 40 per cent. of the Typhoid Fever is due to water, 25 per cent. to milk, 30 per cent. to contagion—including fly-transmission, and only about 5 per cent. to all other causes. The Board of Officers of the Public Health and Marine Hospital Service investigating Typhoid Fever in the District of Columbia found in 1906, that of the cases studied by them about 11 per cent. were indefinitely attributed to

* Read before the American Public Health Association at Winnipeg, August, 1908

milk infection, about 7 per cent. to infection by contact; in 1907, they definitely attributed about 9 per cent. to milk and about 19 per cent. to contact.

In the study of an outbreak of Typhoid Fever it is of vital importance, first of all, to determine whether the disease is really Typhoid Fever. For this purpose, in addition to the usual bedside methods, two other procedures may and should be employed in all doubtful cases. I refer to the Widal reaction and to blood cultures. The blood culture is of more value than the Widal test in that cultures can be obtained in the first days of the disease. For the examination of the blood we have found the bile enrichment method, followed by plating on Endo medium, the most satisfactory. By this method, cultures taken in the first week of the disease will give positive results in 90 to 100 per cent. of the cases.

Having determined that the disease prevailing with undue frequency is typhoid fever it is necessary that each case be studied in detail from an epidemiological standpoint. In places which require the reporting of Typhoid Fever, the study is much easier than in those where it is not done. The essential data can only be obtained by competent persons visiting the patients and obtaining all possible information from the patient, nurse and family, and by an inspection of the premises.

It is well to have a map of the city and, as the data for each case are collected, to indicate the location on the map by sticking in a large pin. A glance at this will readily show if the cases are confined to any particular locality.

All data collected should be at once tabulated and carefully studied as to the bearing of the various probable sources of infection.

I shall now take up in detail the special characteristics of outbreaks of Typhoid Fever due to infected water and milk, and to transmission by flies, etc.

CHARACTERISTICS OF OUTBREAKS DUE TO WATER.

The striking characteristics of outbreaks of Typhoid Fever due to water are:

1. *General distribution of cases throughout the area supplied by a particular water.*

The incidence of cases is independent of social conditions, occupation and age, except that very young children as a rule are not affected in equal proportion to other ages, due, perhaps to the difference in susceptibility and to taking less water.

2. *Explosive onset of the outbreaks.*

When the water supply previously good becomes suddenly infected, as in the case of Plymouth or Butler, Pa., the outbreak begins with great suddenness and violence. There is a sudden and great increase in the number of cases reported; this increase may continue until the sources of infection of the water are removed or the water supply changed. If the former be the case there is a more gradual decline in the number of cases than when the supply is suddenly replaced by a pure one, in which case the decrease is sudden and marked. Secondary cases from contacts may keep the number above normal for a time.

When there is a continuance of the source of the infection, as in the case of the Lowell and Lawrence outbreaks of 1890 and 1892, the onset is not usually so explosive in character and the decline is more gradual. In Pittsburg, where there is a continual infection of the water supply, the disease is more prevalent in the Fall and Winter, which may be due in part to other causes than water.

When a water supply, such as a river, is subject to continual infection the increase in the number of cases in late Summer and Fall may be attributed to the fact that, as the number of cases increase which supply infection for the stream, the amount of infection is correspondingly increased.

3. *Seasonal prevalence; Spring or late Winter.*

Outbreaks of Typhoid due to infection of a water supply previously good usually occur in the late Winter or Spring. This is due, as in the case of the Plymouth and New Haven epidemics, to the fact that infected discharges are thrown on the frozen ground and when thaws or floods come the infection is suddenly washed into the stream.

When a supply becomes infected by the failure of the purification methods used or by a change in the source, the outbreak is, of course, independent of season.

4. *Comparative freedom from the disease of persons not using the suspected water.*

When there is more than one water supply or where persons use pure bottled water or boil the water, the comparative freedom of such persons from the disease is striking. This was well shown in the Butler epidemic, where a large part of the first ward of the city received their water from deep driven wells; in this ward, with an equal population to the other four wards, there were only about one half as many cases.

5. *Inspection of the water shed shows evident sources of infection.*

An inspection of the water shed may show that it is being continuously infected by discharges of Typhoid Fever cases. In some cases, as at Butler and other places, the discharges may actually have been allowed to go directly into the stream from privies overhanging it.

6. *The outbreaks may have begun or ended, following a change of the water supply.*

When a previously good water is replaced for any good reason by an unknown water or a suspected water is replaced by one of undoubted purity, the consequent beginning or discontinuance, as the case may be, of an outbreak of Typhoid would properly be laid to water.

7. *Bacteriological and chemical examination reveals evidences of pollution.*

While it is practically hopeless to expect to find the typhoid bacillus in water, still the finding of *B. coli* in small amounts of water and chemical evidences of pollution are additional evidence against the water.

8. *Exclusion of all other probable causes.*

This means the exclusion of milk, food, contact, fly transmission, and other possible sources of infection.

OUTBREAKS DUE TO MILK.

On investigating an outbreak of Typhoid Fever, the following points would indicate very strongly that the infection was being introduced through the milk.

1. Sudden outbreak of an unusual number of cases followed by a rapid decline.

The outbreak is frequently sudden in its onset; a large number of cases occurring on a certain milk route within a few days. If the infection be introduced only once, as by flies, there is a sudden rise followed by a sudden decline in the number of cases. If there is a continuance of the infection, as from a bacillus-carrier, the onset may be more gradual and the decline will be delayed.

In dairies which do not practice sterilization of bottles, the milk may become infected through bottles delivered at houses where there are cases of Typhoid Fever; these infected bottles are returned to the dairy, refilled, and delivered to other customers. Where the milk becomes infected by washing the cans with infected water, as in the Palo Alto outbreak, the number of cases is usually much greater than when infected in other ways. After the usual incubation period secondary cases from contacts begin to appear.

2. The appearance of an unusual number of cases among customers of a certain dairy.

The appearance of an unusual number of cases without a general increase elsewhere on the route of a dairy should at once direct especial attention to the milk. Of course Typhoid Fever due to infection from other sources may occur among persons supplied by a particular dairy, but they will not be found to be chiefly consumers of the milk. It is often very striking how the consumers of a dairy whose milk is infected may be picked out by the unusual proportion of cases on that milk route. Very frequently cases may be traced in persons not directly supplied by the suspected dairy, but who have taken this milk at the home of some friend or at a restaurant. An increase in the number of cases on a certain route associated with a decrease generally throughout the city is particularly suggestive of milk infection.

3. Unusual incidence of cases among users of milk.

It will be found that there is unusual prevalence of Typhoid Fever among the users of milk; the non-consumers escape or develop as secondary cases. As women and children generally use more milk than men an unusual prevalence of the disease among them is a common feature of milk-borne outbreaks. Those families on the suspected route who make a practice of pasteurizing their milk escape, except from infection as secondary cases.

4. More cases among the well-to-do than among the poor.

In a milk outbreak there are usually more cases among the well-off, due to the fact that they are more able to buy milk and use it in larger quantities than the poor, while in fly-borne outbreaks the poor and those living under insanitary conditions are more often attacked.

5. The finding of the typhoid bacillus in the suspected milk.

This is practically hopeless, as the milk rarely comes under suspicion for at least three weeks after having

become infected. In addition, the technical difficulties are so great that it is an almost hopeless procedure, though the isolation of the organism should be attempted. If successful, it is absolutely conclusive.

CHARACTERISTICS OF THE OUTBREAKS DUE TO CONTAGION AND TRANSMISSION BY FLIES.

It is impossible to state definitely the characteristics of outbreaks of Typhoid Fever due to transmission by flies and to contacts as in the case of milk and water outbreaks. A final conclusion in regard to the source of the infection can only be reached by a consideration of all the factors involved.

For purposes of convenience I shall discuss the characteristics of outbreaks of Typhoid Fever due to contagion and transmission by flies at the same time. The great part played by flies in the transmission of Typhoid Fever was first emphasized in the masterly Report of the Origin and Spread of Typhoid Fever in United States Military Camps during the Spanish War by Reed, Vaughan and Shakespeare. They concluded that "flies were undoubtedly the most active agents in the spread of Typhoid Fever. Flies alternately visited and fed on the infected fecal matter and the food in the mess tents. More than once it happened when lime had been scattered over the fecal matter in the pits, flies with their feet covered with lime were seen walking over the food. Typhoid Fever was much less frequent among members of messes who had their mess tents screened than it was among those who took no such precaution. Typhoid Fever gradually died out in the Fall of 1898, in the camp at Knoxville and Mead with the disappearance of the fly, and this occurred at a time of year when in civil practice Typhoid Fever is

generally on the increase. The first pits at Knoxville contained, before the first twenty-four hours had passed after the arrival of the troops, fecal matter infected with the Typhoid bacillus. Flies swarmed everywhere. Instead of abating, the disease increased. The soldiers were using the same water used exclusively by the inhabitants of West Knoxville, and among the latter there was not at that time a case of Typhoid Fever. Certainly the disease was not disseminated through the drinking water.*

Alice Hamilton† investigated in 1902 an outbreak of Fever in the Nineteenth Ward of the city of Chicago. This ward, which only contained about one thirty-sixth of the total population of the city, had between one-sixth and one-seventh of all the deaths from Typhoid Fever. It seemed to her that, while the water was undoubtedly the causative factor in the epidemic throughout the city, there must be some local cause for its undue prevalence in the Nineteenth Ward. The sanitary arrangements in this ward were found to be very bad and on those streets with the worst sanitary arrangements there were the largest number of deaths from Typhoid Fever, irrespective of the poverty of the inhabitants.

Flies caught in two undrained privies, on the fences of two yards, on the walls of two houses, and in the room of a Typhoid patient, were used to inoculate 18 tubes; from five of these tubes the Typhoid bacillus was isolated. In this outbreak the chain of evidence implicating the fly in the spread of the disease was certainly convincing and almost complete.

The outbreak in the city of Winnipeg, in August, 1904, investigated by Dr. E. O. Jordan, which was confined almost entirely to the poorer part of the city, was attributed to transmission by flies and contacts.

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*† Journ. Am. Med. Ass., vol. 40, 1902, p. 576.

Outbreaks due to direct contact are seen especially in institutions where there are Typhoid Fever cases and in houses where the family and friends visit and assist in the care of the patient. In these cases the infection is conveyed either directly by the future patient or indirectly by the nurse to food consumed by others.

Typhoid-carriers, such as the one reported by Soper in the person of a cook, who was responsible for at least 28 cases of Typhoid Fever in families in whose employ she had been, are instances in which the infection is conveyed by a third person.

The bacilli have been found in practically all of the excretions of Typhoid Fever cases and it is only by the most scrupulous care on the part of the attendant that infection can be avoided for himself and others. The Board of Officers of the Public Health and Marine-Hospital Service, studying Typhoid Fever in the District of Columbia, attributed about 7 per cent. of the cases in 1906, and about 19 per cent. in 1907, to contact infection from other cases.

The chief characteristics, then, of outbreaks of Typhoid Fever due to transmission by flies and by contact are their local character, their appearance in places where the sanitary conditions are poor or where they are neglected, occurring during the fly season in the case of fly-transmission and among those most closely associated with the patient.

TYPHOID BACILLI CARRIERS *

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ABSTRACT.

During the past few years a number of epidemics of typhoid fever, traceable to chronic "typhoid bacilli carriers" have been reported. Although Frosch called attention to the existence of carriers and the responsibility of their transmitting typhoid fever in 1902, and Lentz[15] in 1905, wrote an exhaustive article in which he mentioned a number of cases of typhoid fever traceable to such, the first recognized striking example of the influence of a chronic typhoid bacilli carrier was reported by Kayser[9] of Strassburg, in 1906. In order to condense our subject matter at the same time furnish a basis for making deductions, the essential data of the principal epidemics of typhoid fever traceable to bacilli carriers reported up to this time, are given in the following table. The details of these cases may be obtained by consulting the original articles referred to in the bibliography.

This table (page 261) is very interesting and enables us to formulate certain general conclusions (based on carriers who have transmitted the disease to others):

1—About 75 per cent. of all carriers thus far recorded are women.

2—Almost without exception, the carriers have either been engaged in some occupation as baker, cook or handler of

* Read before the American Public Health Association at Winnipeg, August, 1908

Reported by	When case Reported.	Place of Occurrence.	Number of Carriers Reported.	Sex.	Occupation.	Carrier had Typhoid Fever in	Carrier never had Typhoid Fever.	Carrier transmitted Typhoid Fever to number of people	Typhoid bacilli isolated from	
									Feces.	Urine.
Kayser	1906	Germany	1	Female	Baker	1896		Quite a large number	+	
Kayser	1906	Germany	1	Female	Milk trade			17		
Neiter & Leifmann	1906	Germany	11	Females	Inmates Insane Asylum		+	Number of cases		
Neiter	1907	Germany	13	Females	Inmates insane asylum			Number of cases	+ from all	
Kossel	1907	Germany	1	Male	Milker dairy		+	Number of cases	+	
Soper	1907	U.S., N.Y.	1	Female	Cook			26	+	
Levy & Kayser	1907	Germany	1	Female	Inmate insane asyl'm	1904		Number of cases		
Dehler	1907	Germany	2	Females	Inmate insane asyl'm			Number of cases	+	
Southworth	1907	U.S., N.Y.	1		Child, 16 mos. old	1907		4		
Albert & Gunn	1907	U.S., Ia.	1	Male	Kept cow and distributed milk	1906		13		+
Ledingham	1908	Scotland	3	Females	Inmate insane asyl'm			Number of cases	+	
Scheller	1908	Germany	1	Female	Milker in dairy	1891		32	+	+
Scheller	1908	Germany	18		Obtained milk from same dairy			13	+ (10)	(10) +
Dean	1908	England	1	Male	Physician	1879			+	+
Gregg	1908	U.S., Mass	1	Female	Keeper of boarding house	1856		7	+	

milk, which has enabled them to transmit typhoid bacilli to substances used as food by others, or who, such as children, or inmates of insane asylums, are careless about their personal habits.

3—Carriers have in some instances had typhoid fever but a short time previous, in others as long as 10, 30 and even 52 years.

So far as present methods of examination have enabled us to determine, the bacilli, in the majority of cases of typhoid fever disappear within 8-10 weeks after the beginning of the disease. It has therefore been suggested that we consider as "chronic carriers" all who still carry the bacilli 10 weeks after the beginning of the disease or in case of a recurrence, from the beginning of such.

Klinger[12] examined the feces of 428 cases of typhoid fever, and found that 8 or 1.7 per cent. of them continued to harbor the specific bacilli longer than six weeks after the temperature had become normal. Kayser[11] found that three of 101 persons who had typhoid fever in 1903, 1904, and 1905 still discharged typhoid bacilli with their feces in 1906. Others have found that as high as 5 per cent. of the cases of typhoid fever become chronic carriers. Carriers who have never had typhoid fever are fairly numerous. These cases, which Lentz refers to as "symptomless typhoids" do not readily contract the disease, partly because the body has gradually become immunized. It has been estimated that probably 1 in every 500 adults who have never had typhoid fever is a chronic carrier. Fortunately, however, the majority of them do not carry the bacilli very long. They have therefore been referred to as "acute carriers" as distinguished from "chronic carriers." It is impossible at this time to state just how long on an average, the bacilli carriers remain as such. Considering, however, the various figures obtainable at the present time, it has been estimated that there are about one-half as many typhoid-bacilli carriers as there are number

of cases of typhoid fever in a given community in one year.

To illustrate the part they played in the spread of typhoid fever, it may be mentioned that of 386 cases of typhoid fever in one sanitary district in Germany, 20 per cent. were traced to "chronic carriers." So far as we know the bacilli leave the body of chronic carriers somewhat more often in the feces than in the urine. Often they occur in the urine, even if they cannot be found in the feces. Both should therefore always be investigated. It is of importance to note that typhoid bacilli may usually be found in much larger numbers in the feces or urine of the chronic carriers than of typhoid fever patients. So far as our present knowledge goes, the gall bladder is the principal organ in which the typhoid bacilli of chronic carriers develop and from which they constantly pass into the intestinal canal.

This then is a great problem. It opens up an important phase of the epidemiology of typhoid fever. A due consideration of this phase of the subject will, I am sure, clear up the source of many cases and epidemics of this disease which cannot be well explained by the ordinary well-recognized modes of infection and which have hitherto been so puzzling. Whenever there are household epidemics or a series of outbreaks of the disease in a locality or an institution or among soldiers in the field we should consider that a "bacilli carrier" is the most probable source. If an individual has an attack of cholecystitis or biliary colic soon after an attack of typhoid fever, we should suspect that such has been caused by typhoid bacilli and that such a person is a typhoid bacilli carrier. Our knowledge of this phase of the subject is already sufficiently definite to warrant the consideration of special methods of preventing typhoid fever patients from becoming typhoid bacilli carriers, and typhoid bacilli carriers from giving the disease to others. As a remedial measure applicable at the present time may be mentioned:

1—The administration of hexamethylenamin, in sufficiently large doses gives antiseptic properties to both the urine and the bile. Richardson[22] has recommended the giving of hexamethylenamin as a prophylactic to all typhoid fever patients in doses of 30 grains a day for ten days, beginning with the third or fourth week of the disease. Crowe[1] has recently shown that when given in doses of 75 grs. per day, it has a distinct influence in ridding the gall-bladder of contained bacilli. Whether, when given in such doses, it can be depended upon to rid all or even most of the chronic carriers of typhoid bacilli remains to be determined.

2—The feces and urine of typhoid fever patients should be disinfected for at least six weeks after the patient has entirely recovered from the disease, just as during the period of illness, especially if they are liable to contaminate substances used for human consumption.

3—The prohibition of persons known to be typhoid bacilli carriers from engaging in any such occupation as cooking, baking, dairy work, etc., which may from the articles handled endanger the lives of others. This prohibition may well apply to all who have had typhoid fever until by repeated examinations, no typhoid bacilli can be demonstrated. If such precautions cannot be observed, it is exceedingly important that such persons should be carefully instructed as to personal cleanliness.

4—The isolation of chronic bacilli carriers in insane asylums and similar institutions.

5—Our public water and milk supplies should be more carefully protected and placed under proper municipal control.

As measures which may become applicable at some future time may be mentioned:

1st—Routine bacteriological examination of the feces and urine of convalescing or convalescent typhoid fever

patients to determine the presence or absence of typhoid bacilli as a condition for release from quarantine, just as is now done in connection with diphtheria. This would apply not only to the typhoid fever patients, but to those who have taken care of such patients or in any way been exposed to infection. Ledingham[14] suggests examinations of the excreta of all who have had typhoid fever once a month for a period of at least six months.

2nd—Operation in the nature of a cholecystotomy and drainage of the gall-bladder or complete removal of the gall-bladder. Such seems especially applicable for inmates of insane asylums. (See Dehler[3] and Grimme[7]).

3rd—Vaccine therapy. If vaccination against typhoid fever proves as efficient as some of our statistics lead us to believe, it is not at all improbable that at no distant day we shall be vaccinating against typhoid fever, just as we now vaccinate against small-pox, wherever the disease is endemic or whenever it becomes epidemic.

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INVESTIGATION OF TYPHOID FEVER EPIDEMIC AT SHEBOYGAN, WISCONSIN *

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An epidemic of Typhoid Fever started at Sheboygan, Wisconsin, during the last of January, 1908, and continued until June, 1908. The Wisconsin State Hygienic Laboratory was called to investigate the situation, and went up and endeavored to discover the cause of the large number of cases of Typhoid Fever.

Sheboygan is a very beautiful little city of about 27,000 or 28,000 inhabitants. Being located on Lake Michigan at the mouth of the Sheboygan river, it occupies a most advantageous position among Wisconsin cities.

The nationality of the city consists of about 80 per cent. Germans, some Poles, Armenians, Greeks and Jews, and the rest Americans.

GENERAL DEATH RATE.

Oct. 1, 1905 to Sept. 30, 1906	13.4 per 1,000 inhabitants.
Oct. 1, 1906 to Sept. 30, 1907	13.5 per 1,000 inhabitants.
Oct., 1907	15.7 per 1,000 inhabitants.
Nov. 1, 1907	16.0 per 1,000 inhabitants.
Dec. 1, 1907	11.3 per 1,000 inhabitants.
Jan. 1, 1908	15.1 per 1,000 inhabitants.
Feb. 1, 1908	16.9 per 1,000 inhabitants.
Mar. 1, 1908	18.9 per 1,000 inhabitants.
Apr. 1, 1908	18.4 per 1,000 inhabitants.

* Read before the American Public Health Association at Winnipeg, August, 1908

DEATH RATE BY INTESTINAL TROUBLES.

Oct. 1, 1905 to Sept. 30, 1907 .... 62 deaths.

DEATH RATE BY TYPHOID FEVER.

Jan. 1, 1908 .... 1 death.
Feb. 2, 1908 to Mar. 4, 1908 .... 7 deaths.
May 2, 1908 to June .... 2 deaths.

During the seven months from October 1, 1907, to April 30, 1908, 6 per cent. of the deaths were from Typhoid Fever. The general death rate is abnormally high. December is the only month that had a lowering of the death rate, and it ran a little below normal, figuring twelve per thousand as normal. This death rate is especially high too, since the census of 1905 was not used, but an estimated census of 1908. Had the census of 1905 been a basis for estimation, the death rate would have been a great deal higher.

NUMBER OF CASES OF TYPHOID FEVER.

May, 1906 .... 30 cases.
Dec., 1906 .... 5 cases and 1 death.
1907 .... 70 cases and 10 deaths.

Most of the cases of 1907 were in the early Spring, March having 26 cases and 4 deaths. Among these cases 17 were in very bad hygienic surroundings, 7 or 8 were cases contracted out of town, 3 cases were from well water, and the source of the remainer was not able to be found.

Jan. 1908 .... 8 cases.
Feb. 1908 .... 12 cases.
Mar. 1908 .... 22 cases.
Apr. 1908 .... 32 cases.
May, 1908 .... 26 cases.

During the first five months there was a great increase in the number of cases of deaths, the greatest number occurring in March and April.

In understanding the water supply of Sheboygan one must also have a knowledge of the sewer system. The

sewer system consists of a combination storm and sanitary sewer flowing by gravity in the Sheboygan river and then into Lake Michigan. Four sewers empty immediately into Lake Michigan and seventeeen empty into the Sheboygan river. There is a great number of factories along the river and emptying their sewage into it. These factories are twenty-six in number and besides dumping the refuse from the factories, the waste from the people there employed also goes into the river. Among these factories are tanneries, rendering plants, dye works, breweries, glove factories, chair factories, and glue works. Besides these factories there are two cemeteries situated on the banks of the river west of the city. One can see from this description what an enormous amount of sewage is being poured into the river and finally into Lake Michigan.

The Michigan Avenue sewer is only about three-quarters of a mile from the intake pipe of the water supply, then next to this is the Niagara Street sewer.

*The Sheboygan water works are owned by the American Water Works Company and their supply obtained from Lake Michigan, being pumped from a standpipe, the capacity of which is 329,000 gallons. It is made of iron 20x140, and its pumping capacity is 15,000,000 gallons per day. The pipe line into the lake consists of bell and spigot cast iron pipe laid in a dredged trench four to nine feet deep. Then the intake is weighted with rocks and the timber crib protected by a screen over the open ends of the pipe which extends into the lake 1,800 feet from shore. There is an emergency intake laid 900 feet from shore. The end of this pipe is also protected by a screen.

The standpipe was emptied and the sediment in the bottom examined and found to be high in bacteria, which was no more than we expected. The bacteria were gas-producing, and some resembled the colon bacillus.

* Now owned by city of Sheboygan.

We then collected samples at several different times and at various places over the lake, starting near the shore and working out along the intake pipe and also two to two and a half miles beyond. Samples were also collected north of the intake on account of the Pigeon river emptying there, and some pollution of the lake was found from that source. Then we collected samples from the intake in Lake Michigan to the mouth of the Sheboygan river. Between the intake and the mouth of the river is a point and ledge of rock extending about 600 feet out into the lake which does offer some protection to the intake by keeping back the polluted water. The results of the analysis are shown in the accompanying table.

From the results of the analysis we can condemn the water, drawing our conclusion from the varying amounts of chlorine, ammonia, nitrates and nitrites, also from the bacterial content, colon being found quite frequently and gas-forming organisms being present all the time.

In regard to the winds over Lake Michigan would say that commencing with February there is generally a pretty strong south-east wind blowing over the lake. This lasts until September or October, then we have a strong west and north-west wind. There seems to be more or less intestinal trouble during the Summer months. The results of our investigations all point to the fact that sewage could be blown back to the mouth of the intake.

The United States Engineering Corps says that there is a general tendency toward a southern current on the west shore of Lake Michigan. They have estimated that during storms on Lake Michigan waves have stirred up the waters to a depth of as low as 45 to 50 feet, but at 60 feet there seems to be no action.

Thus in summing up the results of our investigation, we found that the water in Lake Michigan off the shore of Sheboygan was polluted for a mile to a mile and a half out.

We thought best to recommend a filter plant rather than the extension of the intake. If the intake was extended, it possibly would be only a short time until the pollution would increase and the intake would again have to be extended.

INVESTIGATION OF WATER SUPPLY OF SHEBOYGAN, WISCONSIN. BACTERIOLOGICAL ANALYSIS

Date, 1908		Bacteria per cc.	Acid colonies per cc.	Colon Bacilli	Gas-producing Bacilli
Feb. 3	-	50	10	—	40-42%
Feb. 3	-	50	—	—	Growth
Feb. 12	-	140	45	+	+
Feb. 12	-	350	8	+	+
Feb. 24	-	270	4	—	Growth
Mar. 2	-	40	—	—	"
Mar. 12	-	160	20	?	"
Mar. 23	-	270	10	—	"
Mar. 23	-	280	10	—	"
Apr. 20	-	180	40	+	"
Apr. 20	-	180	75	?	"
Apr. 20	-	180	29	?	"
Apr. 20	-	180	5	?	"
Apr. 20	-	170	5	+	"
May 14	-	—	10	—	"
May 14	-		18	—	"
May 14	-		20	—	"
May 14	-		0	—	"
May 14	-		0	—	"
May 14	-		0	—	"

INVESTIGATION OF WATER SUPPLY OF SHEBOYGAN, WISCONSIN

Date 1908	Specific Location	Turbidity	Color	Odor	Total Hardness	Residue on Evaporation	Loss on Ignition	Chlorine	Oxygen Consumed	Free Ammonia	Alb Ammonia	Nitrites	Ni-Trates
Feb. 3	Tap	350	Milky	Earthy	185.3	209.1	90.8	10.0	1.5	0.015	0.09	1.0	—
Feb. 3	Well at Pumping Station	200	Clear	Earthy	183.0	130.0	100.0	10.0	2.0	0.02	0.09	0.5	—
Feb. 12	Intake well	600	Milky	Earthy	185.0	140.0	80.0	12.0	2.0	0.044	0.125	0.20	—
Feb. 12	8th St. Hydrant	600	Yellowish	Earthy	182.0	184.0	60.0	13.0	2.0	0.015	0.7	0.025	—
Feb. 24	Intake well	600	Milky	Earthy	180.1	130.0	30.0	9.0	1.5	0.03	0.115	Trace	—
Mar. 2	Tap	550	Milky	Earthy	181.19	199.2	75.8	10.0	1.824	0.03	0.111	"	—
Mar. 12	Intake well	450	0	Earthy	180.0	190.3	65.0	9.5	1.8	0.02	0.10	"	—
Mar. 23	Intake well	400	0	0	182.0	195.01	74.3	14.0	2.0	0.08	0.11	"	—
Mar. 23	Tap water	300			182.5	188.2	75.0	11.0	1.5	0.05	0.07	"	—
Apr. 20	Intake well	300			188.4	206.1	80.4	10.0	1.5	0.04	0.08	"	—
Apr. 20	Inside reef 15 ft. deep	400	Slightly Green	Musty	188.2	119.2	71.2	12.0	2.184	0.05	0.205	"	—
Apr. 20	1 mile out 28 ft. deep	200		Musty	178.2	122.4	81.6	10.0	2.552	0.005	0.14	"	—
Apr. 20	1 mile out 50 ft. deep	30			182.4	140.0	71.6	16.0	1.5	0.08	0.18	"	÷ : ÷
Apr. 20	$1\frac{1}{4}$ mile out, 55 ft. deep	30			180.5	126.4	50.2	8.0	0.5	0.015	0.14	"	—
May 14	Break in intake	500	Dirty	Musty	180.2			13.0		0.065	0.097	—	—
May 14	End of intake	400	Dirty	Musty				12.0		0.001	0.15	—	—
May 14	1 mile out 40 ft. deep	100	—	—				10.0		0.0125	0.148	—	—
May 14	$1\frac{1}{4}$ mile out, 45 ft. deep	30						10.0		0.0075	0.065	—	—
May 14	2 miles out 55 ft. deep	10						8.0		0.0004	0.001	—	—
May 14	$2\frac{1}{2}$ miles out, 75 ft. deep	10						7.0		0.0025	0.005	—	—

MORBIDITY AND MORTALITY STATISTICS OF TYPHOID FEVER IN THE MIDDLE WEST *

By Dr. C. A. HARPER
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In collecting morbidity statistics for Typhoid Fever in the Middle West it is found impossible to obtain reliable data. Therefore, as far as morbidity statistics are concerned in this paper, the lack of completeness in these reports will be more strongly exemplified than any other feature. I have endeavored, however, to classify them upon a basis usually adopted in the estimating of Typhoid mortality statistics.

It is found also that while the mortality reports are much more accurate than the morbidity reports, yet there are variations as to the completeness of this feature.

No reliable data could be obtained for the State of Iowa for the years 1900, 1901, and 1902. In Illinois negative application had to be made for the years 1900 and 1901. Minnesota, Ohio, Indiana and Michigan have tabulated their Typhoid statistics even prior to these dates.

With an aggregate population in Minnesota, Iowa, Wisconsin, Illinois, Indiana, Ohio, and Michigan of 20,000,000 I find that the average mortality rate is twenty-six per 100,000 population. Considering the total number of deaths from Typhoid Fever reported each year in the Middle West I find that there has been a steady decline in the number of deaths reported, from 5711 in 1900 to 4707 in 1907. Since 1900 the reports of all deaths have been much more accurate in all of the States included in the investigation, with the possible ex-

* Read before the American Public Health Association at Winnipeg, August, 1908

ception of Illinois. That there should be such a decline in the number of deaths reported in spite of the greater accuracy is reliable assurance that the mortality from Typhoid Fever and also the morbidity from this disease is on the decrease.

DEATHS FROM TYPHOID FEVER IN THE MIDDLE WEST

STATE	Deaths from Typhoid Fever by years								Total deaths	Average deaths per year	Death rate per 100,000 population	Estimated no. of cases per year
	1900	1901	1902	1903	1904	1905	1906	1907				
Minnesota	351	377	311	371	331	289	383	308	2721	340	19	3400
Iowa				171	209	295	77	248	1000	200	89	2000
Wisconsin	178	236	153	273	264	328	361	287	2080	260	13	2600
Illinois			1882	1578	1300	1047	1061	1119	7987	1331	27	13330
Indiana	1440	1198	1217	1013	1013	928	913	852	8574	1072	42	10720
Ohio	1291	1143	1253	1548	1521	1253	1238		9247	1321	31	13300
Michigan	920	665	596	640	731	661	698	572	5483	685	28	6900
TOTAL	5711	5150	5612	5594	5369	4801	4731	4707		5209	249	52250

A cursory examination of the Typhoid situation in various sections of the United States tends to show that Typhoid Fever is more prevalent in the Middle West than in other State groups, with the exception of the Southern tier of States. For the census year 1900 the death rate from Typhoid Fever per 100,000 population in the registration States was Connecticut, 27.4; Maine, 28.8; Mass., 23.3; Mich., 28.1; New Hampshire, 16.8; New Jersey, 21.1; New York, 24.4; Rhode Island, 23.8; and Vermont, 31.1, or an average of 24.8.

A camparison of the rates in states of the United States where comparatively accurate returns are received with rates in foreign countries proves conclusively that there is a startling number of deaths from Typhoid Fever in this country. In foreign countries per 100,000 population for the year 1902, England and Wales gave a death rate of 12.6; Scotland, 12.2;

Ireland, 13.8; Norway, 4.6; German Empire, 7; Switzerland, 6.2; Spain, 45.8; and Italy, 34.6, or an average of 17.1 per 100,000 population. In Michigan during the period 1900 to 1904 the nineteen cities having populations ranging from 5000 to 10,000, the average Typhoid mortality was 40.1 per 100,000 population. In the six cities having populations of from 25,000 to 300,000 the average mortality rate for the five years was 23.3 per 100,000. The largest cities therefore show 16.7 per cent. per 100,000 lower mortality than the smaller cities.

In Minnesota where a comparison has been made between death rates in cities and rural districts for twelve years, from 1888 to 1899, the rate in cities over 15,000 was 65 per 100,000 population. In cities from 5 to 15,000 the rate was 40 per 100,000 population, while in towns and cities under 5000 the rate was 20 per 100,000 population.

The rural and urban mortality statistics in the newer States of the Middle West appear to be reversed as compared with the older States in this same group or older States in the Union. This can probably be accounted for in two ways. First: The rapid growing cities in the newer States have not kept up the proper sanitary conditions in proportion to the increase of population. Second: In rural districts sufficient time has not elapsed for the soil to become saturated so as to infect the well water supplies. The individual holdings of the newer States in the Middle West are larger. Therefore personal contact is less frequent and the transmission of the disease by flies or other germ carrying agents is less likely to occur. In forest regions many country cases are sent to city hospitals for treatment.

It is probable that the morbidity and mortality from Typhoid Fever in the smaller cities and villages is due to the use of shallow wells, the water of which is always liable to contamination by leachings, cess pools, privies, and surface filth contained in the sub-soil. There are, however, many localities in Wisconsin, and I presume in other States, where

it is impossible to trace the source of infection to either polluted water or infected milk supplies. In such cases the disease is confined to smaller cities, villages, or densely populated townships, where the common privies are extensively used without any effort being made to exclude the flis.

A locality once infected by a Typhoid Fever epidemic tends to show recurrence of this disease. This has been particularly well exemplified by the city of Port Washington in Wisconsin. Port Washington is a city of 5,000 population. A dairyman who had cases of Typhoid Fever in his family furnished milk to two hundred families, or an estimated population of one thousand individuals. The sale of milk was stopped within a few days from the time of the outbreak after investigation determined the source of infection. Of the one thousand individuals furnished this infected milk 116 cases of Typhoid Fever originated, with fourteen deaths. Before this epidemic Port Washington had been practically free from Typhoid Fever. Since this epidemic Typhoid is found in this city from

DEATHS FROM TYPHOID FEVER IN CERTAIN CITIES IN THE MIDDLE WEST

NAME OF CITY	Deaths from Typhoid Fever								Total deaths	Average deaths per year	Death rate per 100,000 pop.	
	1900	1901	1902	1903	1904	1905	1906	1907				
Minneapolis, Minn.	67	129	64	101	100	56	82	70	669	84	41	
St. Paul, Minn.	34	21	26	18	26	18	45	35	223	28	17	
Duluth, Minn.	49	36	32	38	38	28	33	29	283	35	69	
Burlington, Iowa					14	13	2	3	32	8	34	
Milwaukee, Wis.	59	63	48	54	43	68	98		433	62	22	
Superior, Wis.		45	15	17	12	10	35	9	143	20	64	
Racine, Wis.		7	10	20	8	8	7	8	68	10	34	
Oshkosh, Wis.							9	9	18	9	32	
La Crosse, Wis.			7	8	5	6	9		35	7	25	
Chicago, Ill.		509	801	588	373	329	370	376	3289	470	29	
Canton, Ohio											42	av. 1890-1904
Cincinnati, Ohio											51	
Columbus, Ohio											48	
Detroit, Mich.		71	71	70	70	71			353	70	27	
Grand Rapids, Mich.		39	39	39	39	53			209	42	48	
Jackson, Mich.		8	8	8	8	15			47	9	34	
Kalamazoo, Mich.	9	8	5	11	7	5	13	6	64	8	20	
Sioux Falls, So. Dakota				36	51	34	17	22	160	32	310	

time to time in various localities. The infection carried there in the year 1904 is still having its effect upon the morbidity and mortality from Typhoid.

The seasonal variation of deaths from Typhoid Fever for the fifteen years from 1887 to 1901 show the highest rates from September to November, with a maximum in October. During the months of July and August in the Middle West the ground water is usually very low, which tends to increase the danger of infection and the mortality is the greatest in October following these months. An examination of the mortality and morbidity statistics by months proves conclusively that the seasonal variation of the disease should be carefully considered. During the season when ground water is low Typhoid Fever is usually prevalent. Pettenkofer states that the maximum of the Typhoid mortality curve corresponds to the minimum of the ground water level. When the water in the wells is low the danger of pollution is greatly increased and since it has been definitely shown that water containing Typhoid bacilli may be greatly diluted and even filtered through a large quantity of soil without losing its infective properties I should not be surprised to find that an overwhelming number of the cases and epidemics from Typhoid Fever originated primarily from a polluted private well.

The rural population in the older sections of the country is largely responsible for Typhoid infected water, and in nearly every case is primarily to blame for Typhoid infected milk.

While it is impossible to determine to what extent camping parties returning to the city are responsible for the annual increase in number of cases, yet this is opening up a new field for investigation which goes to show that the heedlessness of campers gives rise to much of the city Typhoid. This fact is also verified by the return of soldiers after a period of encampment. It appears that in the wealthier residential wards of the cities where the inhabitants are accustomed to taking annual camping vacations the recurrence of Typhoid in these localities

is almost constant at certain seasons of the year, while in other portions of the same city Typhoid is more sporadic.

Not a single city of over 500 in the Middle West has as low a death rate from Typhoid Fever as London, where the rate in 1903 was only 8.3 per 100,000 population. This would seem to effectively prove that there is not necessarily any connection between density of population and the mortality from this disease.

CASES OF TYPHOID FEVER IN CERTAIN STATES AND CITIES

STATES.	Cases of Typhoid Fever by years								Total cases	Average No. of cases per year	Cases per 100,000 pop.	Average No. of deaths per year	Mortality rate
	1900	1901	1902	1903	1904	1905	1906	1907					
Michigan	5122	3002	2456	2840	3028	2774			19222	3204	132	685	21%
Indiana						4632	5230	5088	14950	4983	197	1072	21%
Wisconsin	1465	1804	1007	374	393	658	908	724	7333	917	44	260	28%
CITIES													
Minneapolis, Minn.		630	320	720	738	269	252	181	3110	444	218	84	19%
St. Paul, Minn.				59	73	64	129	183	508	102	86	28	27%
Chicago, Ill.							4000	4500	8500	4250	250	470	11%
Detroit, Mich.													
Grand Rapids, Mich.		254	254	254	254	518			1534	307	349	42	13%
Jackson, Mich.		44	44	44	44	88			264	53	212	9	17%
Kalamazoo, Mich.	71	61	48	121	74	65	72	69	581	73	182	8	4.4%
Milwaukee, Wis.				198	186	351	571	403	1709	342	108	62	18%
Sioux Falls, So. Dakota				125	157	122	119	150	673	135	1310	32	24%

In Milwaukee it is shown that the wards inhabited by the wealthier classes, who form large camping parties during July and August, record a larger number of cases of Typhoid in October than the local conditions could warrant. It has been suggested, and to a certain degree correctly, that it is possible for Typhoid to be taken into these homes by the servant force, who largely come from the poorer, more densely populated, and unsanitary districts. The fact is evident, however, that the servant force is either with the camping parties, or on the

return of such parties has not been in the home sufficiently long to infect the various members of the household.

I simply mention these facts to show the complexity of handling Typhoid Fever. The theory that by furnishing a pure water supply to the larger cities would control Typhoid Fever has been entirely exploded. The facts in the Middle West, and I believe the same are true throughout the United States, show that it is as much a problem in the rural districts as it is in the urban centres, and the campaign against Typhoid must be waged in each locality that contains a population of 40 or more per sq. mile.

In the Middle West we are not confronted so frequently with a mistaken diagnosis of Typhoid Fever for malaria. Very few deaths are recorded in this group of States from malarial fever. In malarial districts it has been shown that there is nearly a 50 per cent. error in the recording of Typhoid statistics due to mistaken diagnosis for malaria. We have, however, a factor in the Middle West which causes the morbidity and mortality statistics from Typhoid to be less than the actual number present. The fact of there being a considerable number of Typhoid cases in any municipality tends to lessen the commercial advantages of such municipality and leads the officials in certain instances, as well as various members of the medical profession, to have the cause of death mis-stated, the complications of Typhoid being given as a factor in producing death, such as pneumonia, hemorrhage, peritonitis and not the disease Typhoid itself. Conservatively speaking I believe we are justified in recording at least a 10 per cent. error in the mortality returns. This possibility of error, however, has not been taken into consideration in compiling the tables.

I have inserted a number of tables classifying the morbidity and mortality statistics of this group of States, in some giving the conditions as they are reported and in others the tables are based upon conservative estimates, using as a basis those States

where the estimated morbidity and mortality statistics are as accurate as it is possible to obtain them at the present time. The occupations, climatic conditions, population, and source of water supply are of a similar character in each of these States and therefore the comparison is a legitimate one.

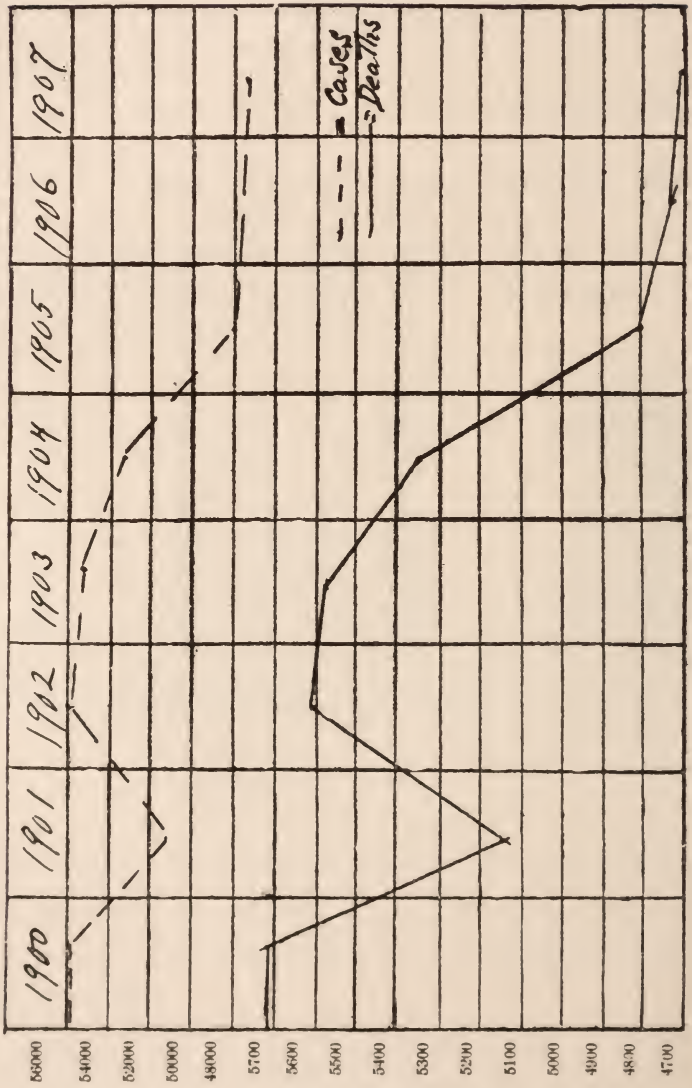
THE RELATIVE IMPORTANCE OF TYPHOID FEVER IN CERTAIN CITIES

NAME OF CITY	Population 1900 census	* Estimated No. of cases per year from 1900–1907	Average No. of deaths per year from 1900–1907	* Estimated No. of cases per 100,000 pop. for City	* Estimated No. of cases per 100,000 pop. for State	Deaths per 100,000 population for city.	Deaths per 100,000 population for State.*
Minneapolis, Minn.	202718	444	84	218	96	41	19.3
St. Paul, Minn.	163065	140	28	86		17	
Duluth, Minn.	52969	175	35	330		69	
Burlington, Iowa	23201	40	8	173	42	34	89
Milwaukee, Wis.	285315	342	62	108	44	22	13
Superior, Wis.	31091	100	20	322		64	
Racine, Wis.	29102	50	10	172		34	
Oshkosh, Wis.	28284	45	9	160		32	
La Crosse, Wis.	28895	35	7	120		25	
Chicago, Ill.	1698575	4250	470	250	135	29	27
Canton, Ohio.	30667	60	12	200	155	42	31
Cincinnati, Ohio.	325902	830	166	250		51	
Columbus, Ohio.	125560	300	60	240		48	
Detroit, Mich.	285704	350	70	122	140	27	28
Grand Rapids, Mich.	87565	307	42	349		48	
Jackson, Mich.	25180	53	9	212		34	
Kalamazoo, Mich.	24404	73	8	182		20	
Sioux Falls, South Dakota.	10266	135	32	1310		310	

* Estimated number of cases using the morbidity and mortality reports for Michigan and Indiana as a basis.

TABLE NO. V.

ESTIMATED CASES OF AND ACTUAL DEATHS FROM TYPHOID FEVER BY YEARS



THE EPIDEMIOLOGICAL DIAGNOSIS AND TREATMENT OF TYPHOID OUTBREAKS*

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The objects of this paper are first to outline a system for the diagnosis of Typhoid epidemics—and second to describe "The Typhoid Tourniquet" or method used in Minnesota for suppressing Typhoid, without waiting for the discovery of the source.

Although I shall consider diagnosis and treatment in this order, treatment of a general characer, as by the "Typhoid Tourniquet" should come first in actual practice.

TYPHOID OUTBREAKS IN GENERAL.

Typhoid outbreaks of many types exist, water outbreaks, milk outbreaks, fly, food and finger or contact outbreaks. Each of these may be explosive or slow spreading; massive or scattered; they may occur as household, neighborhood, disseminated or community outbreaks; or, in form, as epidemic, endemic, or prosedemic. I shall attempt the ambitious task of classifying epidemics under certain heads, as a study necessarily preliminary to the diagnosis in practice of epidemics as they present themselves. But Typhoid transmission is after all a unit; it is nothing but the transfer of Typhoid infected urine, feces and saliva, from the patient, convalescent, or carrier, to other people's mouths. All our various forms of outbreaks are merely the results of the following, by Typhoid infected feces, chiefly, but also of Typhoid urine and saliva, of various

* Read before the American Public Health Association at Winnipeg, August, 1908

paths, laid out and made possible by the intricately imperfect sociological conditions of modern life, and the tracing of the exact paths which these delectable delicacies have followed, in any given case, is Typhoid Epidemiology, in substance.

Typhoid outbreaks may be classified either by vehicle of transmission or by locality distribution. The latter is the more practical primary classification for epidemiological diagnosis since the locality distribution of an outbreak is the first and most easily determined circumstance. Classification by vehicle of transmission cannot of course be made in any given case until the vehicle of transmission is found, and is therefore a *post facto* matter.

For diagnostic purposes, the distribution, (i.e. as to locality), the concentration (i.e. whether massive or scattered) and the rate of onset (i.e. whether explosive or slow spreading) are the most important initial points to be ascertained. Taken together with a study of the sociological conditions amongst which the people concerned live, any Typhoid outbreak will yield a diagnosis sooner or later in face of persistent accumulation of detailed data. But certain sociological conditions are so basic and so universal, that they everywhere govern at least the broad general outlines of outbreaks and amongst these the mere physical grouping of the homes of the people lie at the foundation.

Typhoid Fever, whether found in the isolated family on the farm or in the great city is essentially a communistic disease—a disease peculiarly dependent for transmission on the common ownership of alimentary utilities. Unlike smallpox and some other diseases, mere association of people in the same house or locality will not account for its spread—their association must involve actual contact, or, especially for large outbreaks, communistic use of the same infected food or drink.

The potential capacity of a given locality for propagating Typhoid may be measured *a priori* by estimating the amount of communism in food and drink which obtains there.

The degree of likelihood of this potential capacity for Typhoid Fever infection becoming a reality may be determined *a priori* by estimating the amount of normal fecal and urinary infection which ordinarily enters the food and drink supply under ordinary conditions together with an estimation of the transient traffic in Typhoid convalescents and Typhoid carriers. Any community, through extraordinary combinations of circumstances, may admit to its alimentary utilities the undesirable item of Typhoid excreta; but some communities at all times possess an admixture of normal excreta with the food and drink so constant and so extensive, that to induce Typhoid excreta no unusual road need be found because well beaten paths already exist in such communities by which normal excreta daily circulate amongst and between the sewage, the food, the privy vault, the food, dirty hands, flies, and the food, and are open to any casual Typhoid infected stool also.

CLASSIFICATION BY LOCALITY DISTRIBUTION.

In considering distribution, the epidemiological unit is the household because it is in the household that communistic interests in the same food and drink, the same flies and hands, are always prominent. But the epidemiological household is not necessarily coincident with the family in its ordinary sense. It includes not only isolated families on the farm or in the community, but also boarding houses, hotels, institutions, even hospitals, factories or whole camps, civil or military. The next multiple which the epidemiologist recognizes is the neighborhood—a somewhat indefinite but convenient term, including those in the immediate vicinity of a household, who by mere propinquity rather than by friendship share somewhat in the family life; a neighborhood often uses the same well, the same cow's milk; and has a communistic interest in the same privy vaults, through sharing the attentions of the same flies. The next multiple is the community, composed of several, even numerous neighborhoods, between and amongst

which some at least of the alimentary utilities are shared in common. An epidemiological community therefore may be only part of a municipality, as for instance, the part having a common water supply, or the locality to which is restricted the route of a given milkman.

Besides the distribution by locality, (household, neighborhood, community) there must be recognized a distribution which does not primarily relate to locality. Epidemiological communities of interest other than in food or flies of course exist, such as those which draw people from different localities together as to dinner parties, church entertainments, school reunion dinners, etc., and the Typhoid which so results may be called social Typhoid. In milk and water, and fly outbreaks the infection is carried from a common source to its victims scattered in the community; but in social Typhoid the prospective victims carry themselves from scattered points to the common source of infection. The distribution of Typhoid originating from a social meeting is therefore much like the distribution of a milk-route outbreak, but of course one correlates with the milkman's list of customers, the other with a list of members of a certain social set, of a given church, or school, etc.

When to the factors of distribution are added the factors of concentration and rate of onset, a sufficiently complicated set of conditions to unravel is presented to satisfy the most ardent enthusiast of intricate problems. Household Typhoid may be massive or scattered—explosive or slow-spreading. Neighborhood Typhoid may be massive or scattered—explosive or slow-spreading. Community Typhoid likewise—and of course the original sources of infection in operation may be multiple (as when flies spread infection from several points at once in several adjoining neighborhoods) or both multiple and varied—as when in the same town flies may be responsible in one district, water in another; or all three may operate at one time in one district, the sources being therefore

multiple, varied and coincident; and in all long established outbreaks, especially if neglected, the source of the primary infection is obscured by the multiplicity of secondary foci established in hotels, restaurants, milk-plants, etc., not to speak of such secondary foci as infected families, convalescents and carriers. These forms of outbreak necessarily overlap and spoil the typical picture of initial distribution. Endemic and prosedemic Typhoid is undoubtedly generally of this character, the primary outbreak having long since exhausted itself, leaving no trace of its original form.

SUB-CLASSIFICATION BY VEHICLE OF TRANSMISSION.

Finger or contact Typhoid is undoubtedly the primeval form of Typhoid transmission, requiring the simplest mechanism and but two factors—one, the patient, the other, someone nursing him. This must have been the method of Typhoid transmission in the prehistoric days before our ancestors had formed the simplest communities—when individual families existed alone, living nomadic lives. The mother then, as the mother now, and all through the ages, nursed her sick with the mother's omnipresent love and care. Then as now, the unsuspecting mother, conveyed the discharges to her own mouth, and to the mouths of her family, both directly on her hands and of course indirectly, through her hands touching their food. Water supply infection was probably uncommon in the nomadic times, for the wandering families seldom stayed long enough in one place for both infection and use of the supply by others to occur; and large natural supplies were doubtless generally in use, great rivers, lakes, swift streams—rather than ponds or wells. The absence of communities reduced the chances of serious infection of these waters; their size made dilution an enormous factor in reducing what infection reached them.

Fly infection also doubtless played a part in prehistoric Typhoid. Unlike contact infection, however, it required three factors, the patient, the fly and the food. It was restricted in operation (as contact infection was not) to only part of the year—i.e. fly time and part of the day—daylight. It was further restricted as compared with contact Typhoid in that the conditions necessary for its operation might sometimes be non-existent—doubtless some families even in those days, buried their discharges—and perhaps some may even have kept flies from their food. The cooking of foods when introduced must have also tended to minimize this route of transmission.

Hence direct contact stands out as the oldest, most constant, and most difficult to prevent by public action of all forms of Typhoid transmission. It is the ancient barbarous form—and is found today in all communities where Typhoid nursing is still in a barbaric stage.

Fly infection is also a relic of barbarism. It is now found chiefly in the camps of those who, reverting to the camp life of their ancestors, revert also to their ancestors' primitive ideas concerning camp hygiene. It is found therefore in the town supplied with privy vaults instead of sewage systems, because such towns are, from an epidemiological standpoint, mere camps, with tents of wood instead of hide or bark.

These two, contact and fly infection, are primarily household routes of infection, but fly infection occurs also as a neighborhood matter.

As a household matter fly contact may exist with or without sewage, in any community, even the largest, most civilized, where prompt disinfection and disposal of feces in the bed chamber does not exist; but only in fly time; and only where neglect of feces, and of the screening of food after cooking, or of raw food is found. As a neighborhood matter, a fly outbreak may be found in any community where tremendous overcrowding exists, as for instance in tenement districts of even the great sewered cities, i.e., where the neighborhood

reverts practically, so far as flies are concerned, to a household, having its flies in common; but it chiefly occurs in new communities, not so crowded, having outdoor privy vaults, open to fly visitation. An explosive community outbreak from flies can hardly exist, unless the community be very condensed, practically a neighborhood, a military camp, etc., or the infection be multiple—i.e., from a number of vaults infected at the same time. Extension by slow spreading may occur where privy vaults are in use, for of course, the neighbor has a neighbor, and the neighbor's neighbor has a neighbor.

The next stage above the nomad is found when families settle down, in camps, whether of canvas or wood. Then the household infection of contact and flies become neighborhood matters and the introduction of household wells, often used by three or four families in common, introduced a new form of outbreak, due to private or "own wells." The individual or "own well" stage gives outbreaks limited to the family, sometimes, if neighbors use it, to the neighborhood. From studies made amongst the new settlers in the northern districts, I deduce that the well of our primeval ancestors must have been an eight-foot hole in the ground, neither round nor square, as close to the back door as possible; that a few logs were thrown criss-cross upon it to prevent horses and children from falling in, dogs and chickens being supposed to get out themselves; that the younger members of the family fished in it for frogs; that water was drawn from it by whatever was the primeval variant of a tomato-can tied to a string; that rains washed the surroundings into the well and floods washed them out again; and that the serious contamination of the well by surface drainage depended merely on the relative elevations of the well and of the family toilet-bush. In such days or under comparable conditions now the family well plays a part in family typhoid and when neighbors use it, in neighborhood typhoid. I believe, however, that, except when excep-

tionally badly placed, so as to receive surface drainage from Typhoid infected feces or when sunk into creviced rock or gravelly strata, open to infection, at a nearby point, the family well of today, even the dug or bored well, but particularly the drilled or driven well is usually not a factor in family or neighborhood Typhoid. The search for family infection from such family wells on the farm is usually futile, so far as I have seen, if the mouth of the well be properly protected. On farms, the initial case comes not from the well, but from the city, and in general secondary cases on the farm arise from contact, flies or milk rather than from well infection.

The next higher grade of civilization is shown by the community having a common water supply, but as yet no sewerage system, i. e., a camp with a public water supply. Such a community is subject to the contact and fly outbreaks common to all camps, but has in addition the additional danger, due to partial civilization, introduced by the fact that all use the same water. A town with individual wells cannot have an explosive water-borne outbreak of Typhoid on such a scale as is possible in a similar town having a public water supply, except under conditions which make the individual wells mere separate pockets of what is truly one common public well—such as floods; or the use of a common water-bearing porous strata. Hence the introduction of a water supply into a town introduces a new source of danger, the community outbreak, but usually municipal pride in the progress of the town is so occupied with congratulating itself on the advance in civilization thus made, that the new dangers and responsibilities inevitably entailed, are usually overlooked.

The town possessing a water supply and a sewerage system is better off than the town possessing a water supply and no sewerage system, simply because the sewerage system cuts out largely the likelihood of fly infection, and

in a minor way, because indoor toilet rooms, which go with sewerage systems, conduce by moral effect and by warmth and comfort in winter, to greater personal cleanliness, thus tending to eliminate contact.

In the earliest stages of the development of a town, each householder has his own cow—or two or three neighbors use the milk supplied by one. At such a stage, milk outbreaks are limited to households and neighborhoods. With the advance of the town to the stage of water and sewerage installation, regular milk dealers, having twenty-five to one hundred or more customers on their routes begin to appear. As the "own well" stage of a town can rarely furnish a massive or community water epidemc, so the "own cow" stage rarely if ever can supply a massive or community milk epidemic. But the introduction of large milk routes, like the introduction of public water supplies, gives at once the needed apparatus for massive milk epidemics—less widespread, it is true, than in public water supply outbreaks, because few milk routes ever secure so wide a distribution of their products through a community as does a public water supply.

From the historical standpoint, therefore, the status of civilization in a given community can be fairly well established from the character of its massive Typhoid outbreaks —the crude frontier community, little more than a camp, except that wood has superseded canvas—shows family and neighborhood fly outbreaks, family and neighborhood milk outbreaks; sometimes family and neighborhood well outbreaks. The next stage in civilization introduces the community water supply outbreak—and when time and sore tribulations have at last taught the lessons of carefully guarded water supplies and the abolition of the privy pit, milk supplies furnish the outbreaks. Of course the silver thread of contact runs through all stages.

So far then, and with certain qualifications, we divide pri-

mary Typhoid by distribution into household, neighborhood, disseminated and community Typhoid. By method of transfer, we may recognize contact as peculiar to household distribution, flies, "own wells" and "own cows" to household and neighborhood; milk routes, dinner parties, etc., to disseminated, and water to community Typhoid. Once a primary epidemic is established, all forms of transmission may occur thereafter, and hence what was originally a milk, water or fly outbreak in a family or neighborhood may become, if neglected, finally a secondary community outbreak.

RATE OF ONSET.

Contact Typhoid is slow moving, usually, because usually the mother or nurse is cleanly (although often illogically so) in her habits; much of the food she handles is cooked. If her hands are not washed before she begins preparing a meal, they often are before the meal goes on the table—washed in the food itself—and such food as is heated thereafter, is sterilized; usually green vegetables, ice, butter, etc., are set on the table last, after the cooking is finished, so that the removal of infection to the food to be cooked which precedes the laying of the table leaves her hands reasonably clean at this later stage. In general, contact Typhoid is not explosive, although there are such cases on record, the explosiveness depending merely on the number of persons exposed at one time to the initial cause. Fly outbreaks may be slow spreading or explosive, rarely massive; but if an unusual number of persons are exposed, at one time, a fly outbreak may be both explosive and massive; milk outbreaks are usually explosive and scattered; water outbreaks usually explosive and massive.

INVESTIGATION.

With these outlines of what to look for laid down, the

process of the investigaton may be proceeded with. The following information must be obtained.

1. A knowledge of the sociology of the community, its population, nationalities, chief occupations, relative proportions of the different classes to each other.

2. The character of the water supply, the milk supply, the food supply, the disposal system for sewage, the prevalence of flies.

3. The social relations of its people.

4. The dates of first symptoms, (from which the states of infection may be calculated) the distribution of the Typhoid cases—the individual water, milk and raw food supplies and sewage disposal of each; their work, social relations; their association with previous cases, and, where possible, with convalescents and carriers.

In practice by far the quickest method is to secure the individual data for each patient first, by visits to the patient or the patient's family, studying by observation and inquiry the other factors above mentioned as the visits are made. The marshalling of these cases in order of occurrence will then furnish the basic data. It is most important to use the dates of infection for all plotted maps, tabulations, etc. The date of reporting is exceedingly misleading.

The next step will be to eliminate secondaries, sometimes a long and tedious process, but quite essential to tracing the original source. By the time the epidemiologist reaches the ground epidemics almost always show secondary foci centering about the untrained nurse, and about the infected hotel waitress, the infected milk peddler, etc. In practice it is usually safe to consider all but the first case in each family as a secondary, especially if between cases an interval of two or more weeks is found, unless evidence exists to show that the primary source still acted and that cause of secondary infection were eliminated by proper house-

hold care. From the remaining or primary cases the origin of the outbreak may be traced.

Notwithstanding that epidemiologists recognize these distinctions it is unfortunately only too true that as soon as cases of Typhoid are reported in an isolated family, a community, a city district, an institution, anywhere, the one idea of the public, the physician and alas too often even the health officer is to analyze water—to write to the City or State Board of Health, enclosing in a vinegar jug, stoppered with a beer-bottle cork, a sample of the well in the back yard of the patient's home. By the time the report is returned—if the State Board is so short-sighted and futile as to analyze such specimens and report on them at all—the outbreak has gained headway by the space of a week or more—more people have used the infected water, if it be infected—more people have used the infected milk, if that be the source—more people have suffered contact or fly infection, etc.—and the fruits of the delay show themselves by an increase of cases in due time. The health officer has learned that Typhoid is not always due to water, the physician is learning—some day even the public may appreciate it also.

THE TYPHOID TOURNIQUET.

If the simplest epidemiological information could be substituted for the so prevalent old wives' fables relating to wells and water, Typhoid Fever could be cut in half merely because then the physician and the health officer would begin to act without waiting for water analyses, or even for a list of the Typhoid cases. The first duty of the health officer, who knows that Typhoid exists in a community is not to make an investigation, but is to face the actual status—to treat the emergency symptoms, without waiting for the discovery of the ultimate cause. If a man is spurting blood from a wounded thigh, the surgeon does not wait

to determine the exact nature and extent of the lesion—nor even the exact vessel concerned—he throws a tourniquet around the whole limb to stop the flow—and then at leisure he investigates, finds the vessel or vessels concerned, and ties it or them in a systematic fashion according to approved surgical canons. Exactly parallel is the condition of a community suffering from Typhoid. Instead of laboriously searching for the particular source—a search which may take weeks, years, or even, as in Washington, D. C., a decade—the proper course is to stop the existing epidemic. To do this requires an immensely vigorous publicity campaign, but it can be done. In Minnesota our first gun is fired—not at the water supply, for we can not know at first that the water is infected—not at the milk supply, for we cannot know at first that the milk is infected—not at the raw food, or flies—we cannot know at first that these are responsible—not at fingers even, although it is always safe to assume that fingers are a factor in every outbreak. We cannot attack any one of these, when first called in, because at that time we do not know which is the cause. We attack every one at once, as the surgeon in the parable ligatures the whole limb. Later we pick out at leisure the particular source and cut that off.

The method is very simple. On finding a Typhoid outbreak in a town, we issue in the papers, display on the streets and address to every householder the following placard:

To the Citizens of Blank.

TYPHOID FEVER IS EPIDEMIC in Blank.

The Minnesota State Board of Health is investigating this epidemic to find its exact source. Meantime govern yourselves as follows:

1. TYPHOID FEVER is contracted solely by the mouth. If you do not put the poison of Typhoid Fever into your mouth YOU WILL NEVER CONTRACT TY-

PHOID FEVER. Therefore, WATCH THE MOUTH.

2. DO NOT EAT OR DRINK ANYTHING (water, milk, oysters, fresh vegetables or anything else) UNLESS it has been first BOILED, BROILED, BAKED, ROASTED, FRIED or otherwise THOROUGHLY HEATED through and through.

3. DO WITHOUT ALL FOOD OR DRINK which has not first been thus heated. (Canned or bottled foods or drinks (other than milk or water) are not included in this.)

4. If living in the same house with a Typhoid Fever patient, DO NOT HANDLE YOUR OWN FOOD, or food intended for anyone else, even if it has been heated, except with HANDS that have been THOROUGHLY WASHED with soap and very hot water. (Preferably also with antiseptic—ask your physician about the antiseptic to use.) WASH BEFORE EVERY MEAL in this way and before cooking, serving or eating ANYTHING OR PUTTING THE FINGERS IN THE MOUTH.

5. If there are flies about, see that all food and drink is protected from them at all times. Flies often carry Typhoid poison to foods and drinks.

6. THE POISON OF TYPHOID FEVER does not show itself for TWO WEEKS after it enters the body. Therefore for the next two weeks, Typhoid cases may develop from Typhoid poison already taken in. But any case which develops on and after (a date two weeks later than the date of the placard) will be due SOLELY TO NEGLECT of this notice and failure to carry out minutely the directions here given.

Later more detailed information is published or mailed concerning contact, convalescents, etc., from time to time. The physicians of the community are visited separately or when possible addressed at a meeting convened for the purpose; in both cases, with the object of posting them on the simple essentials of epidemiology—contact Typhoid,

flies, milk, dangers from convalescents, etc. The successful stopping of a Typhoid outbreak depends on the vigor with which the public, but particularly the physicians can be impressed with facts which neither physicians nor public usually believes—that Typhoid Fever is not necessarily a matter of infected water—and is not even a matter of garbage piles, sloughs, damp cellars or sewer gas—but is a matter of Typhoid discharges reaching mouths. Trained nurses are sent to circulate amongst the poor families, not to nurse but to teach by demonstration how to avoid secondary infection, and every reported case is investigated to determine if the source of infection be primary or secondary in order to cut off the latter.

After getting out this notice, seeing the physicians, etc., as above outlined, lists of the cases to date are obtained direct from the physicians (because the cases are usually not yet reported in full to the health officer,) and then the next step is to see the individual patients and secure from them the epidemiological data.

If physicians are to be efficient and earnest co-operators in epidemiology with health officials, this, and not the mere "report of cases of Typhoid" must be the form required of the physician in his initial report. Until the good time comes when health departments, weary of receiving physicians' reports on Typhoid Fever which convey no useful information, except that a supposed case exists at a certain or uncertain address; and until the health departments, especially State health departments realize that the useful information which the physician might supply when he sees the case early, before the lapse of time, delirium, the exhaustion of the family members from nights of nursing and days of anxiety spoils the evidence, should not be left to be acquired if at all, weeks later, we shall not have epidemic records worthy of the name. When that time does come—when every Typhoid case is regarded seriously, promptly reported,

and immediately fully investigated by trained men with full information as to previous associates, milk, water, etc.—we shall not have epidemics at all—or at least only those which arise from peculiar complications of circumstances, beyond human ingenuity to forestall.

From the data thus secured, the distribution of the Typhoid as it stands at the time is ascertained. Then by the dates of onset of the cases, scrutinized in the light of the data secured as to the chances for contact, and the establishment of secondary foci, all secondary cases are eliminated. This most important step leaves the primary cases to be plotted on a map, and in this way the locality distribution of the original outbreak is ascertained. Applying now our formulae regarding the different causes of the different locality distributions, again in the light of the data as to contact, milk supply, water supply and sewage disposal conditions, the primary cause or causes are determined. Systematically applied, with a sufficient force of trained data-collectors, and with sufficiently energetic and pungent publicity, first the outbreak should be stopped, and second the cause or causes of any ordinary primary outbreak of Typhoid should be found ordinarily within a week or two. When the cause is found, its treatment will be indicated by its own characteristics. Mechanical or physicial deficiencies in a public water supply may be remedied, infected wells disinfected or abandoned, fly-breeding places abolished, houses screened, Typhoid cases, convalescents, perhaps even carriers, removed from milk-handling positions, mothers, nurses, physicians instructed regarding contact infection, and the community placed in a position to obviate recurrence.

But, alas! often the community concerned is too poor, or too unbelieving to follow advice concerning waterworks, reconstruction under supervision, sewage disposal plans, etc.; when the epidemic is over, the old conditions, spas-

modically bettered, are allowed to return, and many times the final abolition of the Typhoid must wait for the growth of a new generation.

CERTAIN CONCLUSIONS CONCERNING TYPHOID FEVER IN THE SOUTH, AS DEDUCED FROM A STUDY OF TYPHOID FEVER IN RICHMOND, VA.*

By **ERNEST C. LEVY, M. D.**, Chief Health, Officer, Richmond, Va., and **ALLEN W. FREEMAN, M. D.**, Assistant Health Commissioner of Virginia †

ABSTRACT.

The study presented in this paper consists of (1) an analysis of the Typhoid mortality statistics of Richmond since 1880, as obtained from the original certificates of death, and (2) the more accurate study which has been made of every case of the disease reported to the Richmond Health Department since May, 1907. Under the latter division the results of one year's investigation (May 1, 1907, to April 30, 1908) are given.

As a result of this study, the authors arrive at the conclusion that Typhoid Fever is naturally more prevalent in the South than in the North in communities with equally good water and milk supplies—in short, that in the South "residual" Typhoid is higher than in the North, on account of the greater length and intensity of the hot season, during which, both North and South, there is normally a marked increase in the Typhoid death rate.

Basing their argument on the fact that all the historic water-borne epidemics of Typhoid Fever have been in other than the Winter months, and on the fact that cities

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* Author's abstract. The full paper (39 pages, with 3 maps, 2 cuts and 1 folded insert) reprinted from the Old Dominion Journal of Medicine and Surgery, Vol. VII, Nos. 5 and 6, may be had on application to either of the authors.

† Formerly Medical Inspector, Richmond Health Department.

with water supplies which are known to be polluted commonly have a Winter Typhoid death rate higher than that of the summer months, the writers conclude that the greatest danger of contaminated water supplies in the causation of Typhoid Fever is in the Winter months rather than in the Summer.

Elaborating this conception, the writers bring arguments to show that public water supplies are naturally a less important factor in the causation of Typhoid Fever in the South than in the North. They emphatically disclaim any intention of underestimating the importance of pure water supplies or of undervaluing the work of "those great men to whom we owe our knowledge of this important branch of sanitary science, as well as those who are today bringing to the people the practical benefits of these teachings."

Although the writers believe that water supply is far from the chief factor in the etiology of Typhoid Fever in Richmond (and, presumably, throughout the South,) they are able to fix the responsibility for a small outbreak in Richmond in January and February, 1908, on the public water supply—74 cases out of a total of 557 during the entire year.

The writers compare at length the Typhoid records of Richmond with those of Washington for a period of twenty-eight years, and show, by tables and a diagram, a remarkable parallel between the Typhoid death rate in these two cities, although the water supply of Richmond has remained unchanged during the entire time, except for the worse, while the water supply of Washington has been four times decidedly changed, and although previous investigators have attributed certain marked fluctuations in the Washington rate to these changes.

From this, and other features of the case, the conclusion is drawn that " there must be some little understood influences of a very widespread character, varying from year

to year, which play a more important role in the epidemiology of Typhoid Fever than has yet been recognized."

In conclusion, the writers state that, as regard further efforts to limit Typhoid Fever, "sanitarians must be content to gain less spectacular victories than those which follow the substitution of a pure water supply for one that is polluted. Having secured a good water supply and thereby having reduced the Typhoid Fever death rate twenty, fifty, a hundred, or even more per 100,000, they must be willing to gain the next five or ten points by efforts ten times as laborious to install and a hundred times as hard to sustain." The directions which these efforts must take, in the light of our present knowledge, which is admittedly imperfect, are indicated in thirteen recommendations.

DISCUSSION.

Dr. John A. MacDonald, of Brandon, Manitoba.—Mr. President: I am under the impression that we are rather inclined to search for the cause of Typhoid Fever too much in water supplies, and I do not think sufficient attention has been given to flies as causal agents of this disease. In corroboration of that, I would say that, notwithstanding the advanced measures taken in Winnipeg, as pointed out by Dr. Douglas, and the results obtained this year and last year, by a strange coincidence the same decrease in the number of cases of Typhoid Fever has taken place in the Province of Manitoba, and by another coincidence, practically the absence of flies accompanied this extraordinary decrease in the number of cases of the disease. The comparative absence of flies this year has also been accompanied by an extraordinary decrease in the number of cases. The town I came from, Brandon, a hundred and thirty-two miles West, also has an equally favorable report with regard to the decrease in the number of cases of Typhoid Fever. The country districts surrounding Bran-

don, which send a number of cases to our hospital, also had an accompanying decrease, both in the number of cases last year and this year. We have been in the habit of having an annex for our Typhoid cases, which was fully occupied during the preceding years by patients, but which we did not open last year nor this year. We have only had three cases sent to the hospital from the city of Brandon this year. Last year we had, I think, in the neighborhood of twelve cases, and we have been in the habit of having twenty, forty, and fifty cases. We cannot help thinking that the absence of flies has had a great deal to do in helping us out in decreasing the number of cases of Typhoid Fever.

With regard to closets, of which Dr. Douglas spoke, I have insisted on metal buckets and a supply of earth being thrown on the excreta each time in the case of pit closets, to exclude flies from coming in absolute contact with the excreta. I have found that that works fairly well. In addition to that, we have a system of having two slop barrels, one for dry, and the other for wet, garbage, both of which are screened from flies. There has been no alteration made in any other plan of the sanitary arrangements, and our most earnest effort has been to guard against flies coming in contact with the excreta.

Dr. William C. Woodward, of Washington, D. C.—I think we are inclined to lay too much stress on the relation between flies and Typhoid Fever. It does not follow because the fly season and the Typhoid Fever season come at the same time, that therefore the flies are the cause of Typhoid Fever. It seems to me not unlikely that some of the causes that promote the life of the flies either favor the life of the Typhoid bacillus or possibly favor the dissemination of other agencies, or maybe reduce the human organism to a condition in which it is more susceptible of

attack than at other seasons. Nevertheless, I believe in working against flies.

Our experience in Washington has been a peculiar and trying one, and the more we study the situation, the less we feel certain of our ground. Our latest movement in Washington toward the prevention of the disease is to require the registration and systematic inspection of every place where food is made and sold, so as to permit careful and systematic control of such places, with a view to insisting on the utmost possible cleanliness. We have passed an ordinance requiring everyone who takes in washing for pay to register. We have not passed as yet any particular regulations concerning the sanitation of these places, but we intend to maintain systematic inspection of all establishments of that kind; specific regulations, if promulgated, will be based on observations. We have promulgated a regulation thus made requiring everyone who maintains a stable, to register, so that we can maintain the same systematic inspection of places of that kind.

Dr. Gardner T. Swarts, of Providence, R. I.—The Health Officer should not be chagrined if he is not successful always in tracing the source of an epidemic of Typhoid Fever. It is very essential that routine methods be carried out, and that water supplies, milk supplies, and flies as carriers of the bacilli of the disease be considered.

We should practice routine methods, such as the inspection of farms which supply milk, and water supplies, try to obtain the Widal reaction in the members of the family, in which there is a case of Typhoid Fever, examine the feces and urine, and in this way endeavor to find the source of the disease, utilizing both negative and affirmative evidence. These methods have been brought before us and developed in such a scientific way, that we can now

make statements more clearly as to the pros and cons in these cases than we could a year or two ago.

Dr. John F. Anderson, of Washington, D. C.—In reference to the investigation of Typhoid Fever in the District of Columbia by the Public Health and Marine Hospital Service, I will say that we have recently selected three blocks and have arranged to get specimens of the feces from every person living in those blocks, with a view to examining them for Typhoid bacilli. From an examination of the feces of 191 persons, we found one that was a bacillus-carrier. His feces had been examined three times, and each time we found a pure culture of the Typhoid bacillus.

Dr. Hibbert W. Hill, of Minneapolis, Minnesota.—A great deal of pains is taken in most places to trace Typhoid outbreaks to their source. Inability to handle an epidemic until the source of the outbreak was found seems to have been assured. Now, in Minnesota, as soon as we get into a town where an epidemic of Typhoid Fever exists, we issue a placard, giving instruction to prevent Typhoid Fever, which is placed on every city block and published in the newspapers. It is also mailed directly to all householders in the city or town.

There is no detail of protection against contact Typhoid which does not need to be explained and demonstrated in the minutest form to the person who has actually to attend to it. By throwing this tourniquet around the whole epidemic at once, we have had great success.

I wish, to move the appointment of a committee to consider the question of Typhoid in every respect, but particularly to agitate in every manner the reporting of cases of Typhoid Fever, and directing their efforts to the munic-

ipality, the health officers, and the individual physicians. A concentrated movement all over this country should accomplish much more in securing reports than spasmodic efforts in isolated places. (Seconded and referred to the Executive Committee.)

Mr. Harry E. Jordan, of Indianapolis.—I desire to call attention to the report of Major Roberts, of the Indian Government, regarding the condition of the soldiers in the Indian Army Service. He points out that the English soldiers were most affected by Typhoid Fever during the Summer months of the Indian year, while the Indian soldiers were effected by the fever during the Winter months. The conclusion he draws is that Typhoid Fever was most prevalent among different individuals during that season to which they were less accustomed by heredity or past conditions of living, and which affords the greatest drain upon their vital resistance. Although they may have received an infection from some source into their system during other seasons of the year, during that season to which their mode of living was less accustomed, they were more susceptible and the morbidity resulting from infection from that source becomes greater.

Laboratory Section

A METHOD FOR THE DETERMINATION OF NITRATES IN SEWAGE AND WATERS OF HIGH CHLORINE CONTENT †

By H. C. McRAE
Chemist Baltimore Sewage Commission

When the sewage testing plant of the Baltimore Sewerage Commission was started in operation it become necessary to make large numbers of determinations of nitrogen in the form of nitrates, and as there was no known accurate and rapid method for this determination, in the presence of high chlorine values, it was thought advisable to make some investigations in hopes of arriving at a satisfactory method.

It was known at the outset that nitrates could be determined, within certain limits, by the so-called brucine method, in which a small sample is treated with brucine in sulphuric acid solution and compared with similarly treated standards, or with permanent standards prepared with a solution of potassium bichromate. The knowledge of this method led to the thought that other alkaloids might be of more value and with this idea in view the following investigations were made.

QUININE:

Quinine sulphate in sulphuric acid solution, 0.2 gram of the salt to 50cc acid, was added to solutions containing,

† Read before the Laboratory Section of the American Public Health Association, at Winnipeg, August, 1908.

respectively, 0, 0.000001, 0.000002, 0.000003 grams of nitrogen as nitrate. A flourescent blue color developed, but without showing a satisfactory graduation to correspond with the different amounts of nitrogen.

MORPHINE:

Morphine sulphate was tested in the same manner with similar results except that the color developed was brown instead of flourescent blue.

NARCOTINE:

Narcotine was tested in the same manner and from the start showed promise of usefulness. The color developed ranged from pink to cherry red and through a certain range the graduation of the color was excellent. After some experimentation the use of narcotine was adopted in the routine work of the laboratory. Two slightly different procedures, which are described below, were worked out to meet two somewhat different conditions.

First:—when the amount of nitrate present is comparatively large and speed is an important factor.

Preparation of standards and samples. Five standards are prepared by placing, in small, 5 inch test tubes, 1 c.c. of solutions containing, respectively, 0.000000, 0.0000005, 0.000001, 0.0000015, 0.000002 grams of nitrogen in the form of potassium nitrate. Samples of 1 c.c., or less diluted to 1 c.c., are placed in similar tubes, after having been clarified by filtration if necessary.

Preparation of narcotine reagent. .0.1 gram of narcotine is weighed out and dissolved in 50 c.c. of sulphuric acid as quickly as possible, with the aid of a stirring rod.

As soon as the narcotine is completely in solution, the reagent is quickly added to both the samples and the standards and the contents of each tube thoroughly mixed by twirling. Readings are made in from fifteen to twenty minutes. By this procedure nitrates can be determined with rapidity and with fair accuracy within a range from 0.5 part per

million to 20 parts per million. Below are given the results of a series of determinations made of solutions prepared in the laboratory, but unknown to the operator. The results are expressed in parts per million:

Actual amounts.	Amounts as determined.
1.0	1.2
1.5	1.5
3.0	3.0
5.0	6.0
10.0	11.0
30.0	30.0

Second:—When the amount of nitrate is comparatively low and accuracy is an important factor.

In order to determine small quantities of nitrates with narcotine it was found necessary to increase the volume of both the sample and reagent. This brings forth a difficulty which makes necessary a more complicated technic. The difficulty is caused by the fact that the intense heat developed, upon the addition of the acid to the water, causes the alkaloid to break down and form a color in the absence of nitrates. This trouble is obviated by using the following procedure:

Preparation of standards and samples. Seven standards are prepared by placing, in 50 c.c. nessler tubes shortened to six inches length, 1 c.c. of solutions containing, respectively, 0.000000, 0.0000001, 0.0000003, 0.0000005, 0.0000007 0.000001,and 0.0000015 grams of nitrogen and diluting to 5 c.c. Samples of 5 c.c., or less diluted to 5 c.c. are placed in similar tubes. 2.5 c.c. sulphuric acid is then added to each tube and the tubes cooled.

Preparation of reagent. First, a portion of the acid to be used is mixed with a portion of distilled water and cooled. The narcotine is then dissolved as quickly as possible in a second portion of acid and the mixture of acid and water added thereto. The ratio of acid to water in the final mix-

ture should be about nine to one and the amount or narcotine used should be 0.1 gram to 50 c.c. of acid.

As soon as the reagent is prepared a 10 c.c. portion is quickly added to each of the standards and samples and the contents of the tubes mixed thoroughly by twirling. Readings are made after twenty to twenty-five minutes. With this technic hundreth's of a part per million can be determined very accurately. The following table, showing the results on a series of solutions, the strength of which was unknown to the operator, will indicate the accuracy with which readings can be made. Results are expressed in parts per million.

Actual amounts.	Amounts as determined.
0.3	0.3
0.3	0.3
0.3	0.3
0.5	0.5
0.8	0.8
0.8	1.0
1.2	1.2
1.5	1.5

While the above table includes no determinations of less than tenth's of a part per million, it is readily apparent that smaller quantities may be determined with equal accuracy, since the use of the full 5 c.c. volume of sample will introduce no error as compared to the use of a 1 c.c. sample, which was used in arriving at the results above.

In conclusion a word of caution in regard to the use of the method may be in place. The reagent decomposes on standing, so that particular care should be exercised to avoid loss of time in adding it to the tubes. Care should also be used to mix the contents of the tubes thoroughly after the reagent has been added. It is not believed that permanent standards can be used successfully with this method, as the color increases in strength slowly even after

long standing. This increase, however, is so slow that it does not interfere with accuracy, provided the reagent is added to the standards and samples at practically the same time. It is realized that the narcotine method, herein described, is not perfect, but it is thought to have some distinct advantages, and it is to be hoped that this presentation may point the way to further improvement. Credit should be given to Mr. G. A. Armeling, Asst. Chemist of the Baltimore Sewerage Commission, for painstaking work in connection with the development of the method.

DEXTROSE VS. LACTOSE FOR DETECTING THE COLON BACILLUS*

By WILLIAM ROYAL STOKES and HARRY W. STONER
Baltimore, Maryland

ABSTRACT.

The classical paper on "The Fermentation Tube" in 1893, by Theobald Smith directed the attention of bacteriologists to the isolation of the colon bacillus from water, milk, and other raw foods. If the gas produced in glucose bouillon varied between 40 per cent. and 70 per cent., the writer thought that all types might be eliminated except *B. coli*, *B. lactis aerogenes* and *B. cholerae suis*.

The investigation of the river waters of Illinois by Jordan demonstrated that the *B. vulgaris*, the *B. cloacae*, the *B. cholerae suis* and the *B. gasoformans* all produced gas in dextrose, whilst practically only the colon bacillus fermented lactose bouillon with the formation of from 20 per cent. to 80 per cent. of gas. In 1904 one of us suggested the use of lactose instead of dextrose bouillon for the detection of the colon bacillus, and the present paper shows that out of 567 gas producing bacteria isolated from the various water supplies of Maryland, only 295 or 52 per cent. were colon bacilli, and all the rest were members of the various other groups. Dextrose bouillon was used in these tests. In order to show the comparative infrequency of organisms other than the colon bacillus, when lactose bouillon or lactose bile was used as the preliminary test we have plated out 3,752 cultures from the fermentation

* Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908

tube. From the lactose media the colon bacillus was isolated in 94 per cent. of cases and other organisms in only 6 per cent. When we compare 6 per cent. to 48 per cent. it is obvious that the lactose medium eliminates a large number of other gas producing types. In a comparison between lactose bouillon and lactose bile, it was found that other types than the colon bacillus were found in 12 per cent. of the tests made from lactose bouillon, and only in 5 per cent. of cases from lactose bile. The lactose bile medium, therefore, eliminates the largest per cent. of other gas forming types and it should be used when it is our purpose simply to isolate the colon bacillus and disregard other gas producing bacteria. In adding up the various percentages in which the colon bacillus was detected in glucose bouillon and lactose bouillon and bile by various authors, we find that the glucose medium gave positive results in 41.1 per cent., while the lactose medium gave positive results for the colon bacillus in 58.5 per cent. of cases. There are two distinct advantages therefore, in the use of the lactose medium, in the first place it eliminates a much larger percentage of gas forming bacteria other than the colon bacillus, and in the second place the colon bacillus itself develops in a large number of instances in a lactose medium than in a glucose medium.

A METHOD FOR THE STAINING OF NEGRI BODIES

By D. L. HARRIS
City Bacteriologist and Pathologist, St. Louis, Mo.

Since the description by Negri in 1903 of certain bodies found in the brains of animals dying of rabies, many methods have been recommended for the staining of these structures. This is in itself evidence that all of them are more or less unsatisfactory at times. Although in most cases the Negri bodies are very numerous, large, and easily recognized, investigators are agreed that in some cases this recognition is very difficult and uncertain.

During the past eighteen months, dogs suspected of being rabid, and those killed by the police, have been sent to the laboratory of the City Bacteriologist of St. Louis for diagnosis. In the beginning of this work we were occasionally unable to demonstrate the presence of Negri bodies in animals which were proven to be rabid through inoculation tests.

In the past year we have developed an eosin methylene-blue stain which has proven so satisfactory and is so rapid and simple that I desire to report the method.

In the routine examinations, smears are made from the cornu ammonis, cerebellum, etc., between two glass slides. Two slides are preferable to a slide and a cover glass, or to two cover slips, as the thickness of the smear can be controlled more easily and there is less danger of soiling the hands. The smear is then treated as follows:

Fix in methyl alcohol one minute.

Wash briefly in water to remove the alcohol.

Immerse in a saturated solution of an alcohol soluble eosin for one minute.

Wash two or three seconds in water to remove the excess of eosin.

Immerse in a fresh solution of Unna's alkaline methylene-blue for from ten to fifteen seconds.

Wash briefly in water.

Decolorize in 95 per cent. alcohol, blot and dry in the air.

The entire process requires less than five minutes.

The structure of the bodies is more sharply defined if the smear is not allowed to dry before being fixed and stained. Smears which have dried for several days or weeks cannot be stained satisfactorily.

The older the saturated solution of eosin (alcoholic), the more rapidly and intensely it stains. A freshly made solution, or one less than two months old, will not yield the best results.

The methyleneblue (Unna's) will produce a very disturbing precipitate over the smear if it be over a week or so old. The fresher the solution the more sharply defined are the "inner" bodies.

During decolorization the slides should be examined from time to time. Decolorize until only the nerve cells are blue and the red blood cells have become bright red. It has been our experience that when the red blood cells appear red, and the nucleoli of the nerve cells a deep blue, and the protoplasm a pale blue, the Negri bodies will be seen colored a blueish red, with pronounced dark blue "inner" bodies. It is better to decolorize too much than too little. The results will be more uniform when the staining is done in staining dishes or jars.

The advantages of this method are:—rapidity, simplicity, strong contrast between Negri bodies, nerve cells and blood

cells; and the absence of a granular precipitate, so disturbing in many methods as to render the recognition of the small bodies impossible.

In the staining of material fixed in Zenker's fluid or acetone, the sections should be stained from three to five minutes in the eosin and from one to two minutes in the methyleneblue. A little practice and familiarity with the solution employed will enable one to judge correctly the time necessary for each step.

THE CO-ORDINATION OF LABORATORY WORK AND INSPECTION IN SUPERVISING THE MILK SUPPLY *

By WILLIAM ROYAL STOKES and T. M. WRIGHT
Baltimore, Maryland

The co-ordination of laboratory work and inspection is a most important matter in directing the attention of health officers to conditions which must be remedied or changed, and therefore there are various laboratory methods which direct the attention of the inspectors to dangerous conditions at various places at the source of supply or route of distribution of milk used in communities.

The colon bacillus has been frequently found by various observers in market milk, and during the year of 1907 we made 809 examinations for the colon bacillus in quantities of 1-1000 of c.c. This organism was present in 228 samples or 28 per cent. of cases.

The tubercle bacillus has also been found in milk, and our present method is to inject the entire sediment from 500 cubic centimeters into the abdominal cavity of a guinea-pig. In 179 experiments 40 per cent. lived over six weeks. These were chloroformed and killed, and sections from the liver showed typical tubercles in four cases. In the 91 animals that died of acute infection we studied the lesions microscopically and streptococci were found quite frequently in the purulent lesions of the liver, omentum and general peritoneal cavity. In six cases these were quite virulent for animals.

* Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

In 540 samples of milk examined by Slack's method we have found over 25 pus cells per field and 50.000 streptococci per cubic centimeter in 27 cases. The samples of milk were obtained directly from the railroad stations, and on following up these cases our inspectors were able to find cases of garget in fifteen cases.

The finding of colon bacilli and high bacterial counts enables us to detect careless and dirty methods on the dairy farm, and improper refrigeration in shipping the milk; careless handling in the stores and dairies can also be detected by these methods. We also hope later to send veterinarians to the farms from which the tuberculosis milk comes in order to use tuberculin in testing the herds.

EXPERIMENTS ON THE PUTRESCIBILITY TEST FOR SEWAGE AND SEWAGE EFFLUENTS * †

By D. D. JACKSON and W. A. HORTON

ABSTRACT.

A sewage or sewage effluent is putrescible if, on standing for a certain length of time, it loses all of its available oxygen. On putrescing the dissolved oxygen, nitrites and nitrates are used up and there being still an excess of organic matter for bacterial action, such action goes on under anaerobic conditions and disagreeable odors are developed. The test becomes a quantitive one when varying amounts of tap water or river water are mixed with the sample to determine the point of greatest dilution at which putrescibility occurs.

A considerable variation in the results has been obtained by using different temperatures of incubation and by the use of different indicators in the test, and the authors have made a study of the various methods employed in order to determine upon the best general mode of procedure. In this study a large number of sewages and sewage effluents of varying character have been tested under different dilutions and with several different indicators.

The methylene blue test as originally devised by Spitta removes the necessity for the use of large bottles to obtain the odor and gives practically the same results on bottles

* Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908

† To be printed in full in the Jour. Amer. Chemical Society.

of 250 cubic centimeters capacity taking the decolorization as an indicator of putrescibility. By the use of this indicator the 37 degree incubator can be employed to advantage. The space required is small and the time necessary for the test is only one-half that which would be taken if the bottles were kept at room temperature.

The only crfiticism of the use of the 37 degree incubator is in the leakage which sometimes occurs around the stoppers of the bottles, due to the expansion of the liquid when the temperature is raised. This loosens the stopper and may drive out some of the originally dissolved gas, and there is occasionally a backward leakage of air. The authors have experimented with various devices for preventing this loss and have found a simple and most effective arrangement. The test is made by replacing the ground glass stopper of a 250 cubic centimeter bottle by a perforated soft rubber stopper through which is a small glass tube or medicine dropper having a large-sized heavy rubber cap tightly attached to the end. The tube is drawn out like the usual medicine dropper and when in position extends in to the liquid in the bottle. A measured amount of the colored indicator is placed in the bottle, which is then completely filled with the liquor to be tested. The dropper is then also completely filled with the liquid, making sure that no air bubbles are left. The tube which extends through the stopper is placed in position and the excess of water pressed out between the bulb and the top of the tube, leaving the bulb in a collapsed state.

When placed in the incubator the bulb will partially fill, due to the expansion of the liquid and the giving off of some gas previously in solution. By this method the expanded water and all gas bubbles are held back and there is no loss of the original water or air in solution, and no backward leakage of air from without.

All of the indicators used were found to be slightly anti-

septic, so that it is best to employ the indicator in amounts as small as is possible to obtain a distinct color. These amounts are, in the case of methylene blue and methylene green, one cubic centimeter of one-twentieth of one per cent. solution for each bottle of 250cc capacity, and for indigo carmine, one cubic centimeter of a one-tenth of one per cent. solution.

It was thought possible that medicinal methylene blue, which is the chloride free from zinc, might be a better indicator than the common methylene blue, which is the double zinc salt. This latter salt is the coloring matter which has been generally used for the putrescibility test.

Our experiments show, however, that the medicinal methylene blue is not as delicate an indicator as the double zinc salt or commercial variety, and that the methylene green is slightly more delicate than the commercial methylene blue.

These differences are probably due to molecular construction. The zinc salts would tend to be more easily broken down under anaerobic conditions and the methylene green would have a greater tendency to be acted upon as it is a mono nitro derivative of methylene blue, and for this reason may be considered to have a slightly weaker point of attack.

In treating undiluted sewages with these three indicators the methylene green was always decolorized first, then the common methylene blue, and finally the medicinal methylene blue. This shows clearly the degrees of delicacy of the three indicators.

The indigo carmine was usually last to be acted upon, but this was not always the case. There seems to be much variation in the action of this indicator, depending upon the nature of the sewage or effluent employed. There is also great variation in the salt itself as found on the market,

as it is composed of indigo sulphonic acids and their salts of greater or less purity.

In waters containing much suspended inorganic matter, it sometimes happens that the coloring matter is precipitated or dragged down to the bottom of the bottle and the liquid above becomes colorless. Such a result should not be mistaken for putrescence, as when the bottle is shaken the indicator will become suspended and will not be shown to have been decolorized.

Some authors have criticized the indicator test as giving positive results at times when no disagreeable odor is developed. It is probable than in such cases the air is entirely used up in the bottle, but the excess of organic matter is not sufficient to develop a much further increase in bacterial action, so that while anaerobic conditions exist, the odor does not sharply indicate the fact. In at least one case the odor of such a sample was obtained by incubating a gallon bottle and then pouring out a portion of the liquid ınd shaking the bottle. In this case a strong odor became ·ident, which would otherwise have been undetected.

CONCLUSIONS.

The test for putrescibility, if made by taking the quires bottles of large size and an incubator space to be practical. As the bottles must be completely the sewage or effluent and can not be shaken e end of the test, a comparison of the time reome putrescible can not be readily made. The test in general is not as great as by the use rs.

best made in bottles of 250 cubic centiaving a perforated rubber stopper, in medicine dropper with a tight rubber npensates for any change in volume

due to the expansion of the liquid, thus preventing loss of water or previously dissolved gas and any access of air.

3. The test should be made in an incubator at 37 degrees C., using the double zinc salt of methylene green as an indicator, and the results taken at the end of four days. This should be considered the standard, but in sewage laboratories, where only rough tests are required, the room temperature may be used, in which case eight days may be taken as the time of incubation.

4. The amount of methylene green used should be one cubic centimeter of a solution containing one-half a gram per liter. Larger amounts of this, as well as of methylene blue, have a slight antiseptic action.

5. The comparison of the relative putrescibility by dilutions of sewages and effluents is a very valuable test of the various methods of sewage treatment. It not only tests the work accomplished by purification plants but gives data as to the amount of dilution necessary to prevent foul odors in the final disposal of a sewage or effluent which enters a stream or other body of water.

THE RESULT OF REINCUBATION AND REINOCULATION OF ATYPICAL DIPHTHERIA CULTURES*

By B. R. RICKARDS, F. H. SLACK and B. L. ARMS
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A Preliminary Communication.

The diphtheria diagnostician recognizes the fact that in his work he meets with a small and fairly constant percentage of cultures for diagnosis showing only irregular or atypical forms, which cannot honestly be reported as either positive or negative. There are of course many cultures which would be considered doubtful by a person unskilled in diagnostic work whch by the skilled diagnostician would be readily relegated to either the positive or negative class; these are not considered here, but we have special reference to what might be called the border-line cultures, containing suspicious forms only, which from peculiarities of morphology, grouping, or staining indicate the presence of the Klebs Loeffler bacillus.

It is urged by some that the diagnostician should always give either a positive or negative report on cultures submitted for examination, and in some ways it might be advantageous to be able to do this; but the laboratory expert who wishes to gain and keep the confidence of the community will best do so by giving honest reports.

It has been the custom of this laboratory to report such

* Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908

cultures to the physicians as "suspicious," and request that other cultures be submitted.

The average practitioner receiving such a report quickly submits the requested second culture, isolates the patient, if this has not been already done, and gives antitoxin. The patient and his family have the advantage then, if the case is positive, of as complete protective treatment as if the first culture had been reported positive, while if the case proves negative he is saved the disadvantage of having been sent unnecessarily to the contagious hospital.

It is of great advantage to physicians in these cases where the diagnosis is delayed to obtain as early a return as possible from the cultures submitted, and if by further work with the primary cultures a quicker report can be sent, this is desirable.

One of us* has previously called attention to the fact that longer incubation or reinoculation sometimes throws new light upon atypical cultures, and that while, as a usual thing, 15 hours' incubation is sufficient for demonstration of *B. diphtheriae* if present, there are occasional cultures possibly containing antagonistic forms of bacteria, for which longer incubation is to be preferred.

In this paper are presented the results of reincubation and reinoculation of 242 such cultures encountered in our routne work from September, 1907, to July, 1908. During this period reports were given on 10,217 cultures, 7,850 beng reported negative, 2,125 positive and 242 suspicious. These suspicious cultures received the usual 15-hour incubation. After being examined and reported "suspicious," the original tube and a transplant on fresh serum were placed in the incubator between 10. A. M. and noon, excepting Saturdays, Sundays and holidays, when cultures were not returned to the incubator until the routine cultures went in at 6 P. M.

* Rickards, Am. Jour. of Pub. Hygiene, Aug., 1908.

Those cultures which were placed in the incubator before noon were examined at 5 P. M., and all cultures were examined at nine o'clock the following morning.

Of the 242 cultures containing suspicious looking organisms, 12 proved to be positive, either from these or subsequent cultures; no subsequent cultures were received from 22 of this number, the majority of the patients being sent to the contagious hospital at once on account of clinical symptoms and the "suspicious" report.

Of the 122 which were not proven positive culturally no subsequent cultures were sent from 40 cases, a part going to the contagious hospital, others clearing up so rapidly that another culture was not considered necessary by the attending physician.

TABLE NO. I.

Summary of Reincubation and Reinoculation in Positive Cases Comparing the Original Tube with the One Inoculated from It and the Subsequent Culture When One Was Received.

Reincubation of original culture was positive at 5 P. M. in 17 instances.

Reinoculation from original culture was positive at 5 P. M. in 16 instances.

Reincubation of original culture was positive following A. M. in 60 instances.*

Reinoculation from original culture was positive following A. M., in 58 instances.* †

Subsequent culture positive in 79 instances.

TABLE NO. II.

Reincubation was positive and reinoculation negative in 20 cases.*

* Apparent discrepency is not a real one as in a few instances original tube was positive at 5 P. M. but negative in the morning having been completely overgrown.

† No 5 P. M. examination made on 15 of above.

Reincubation was negative and reinoculation positive in 16 cases.*

Both were positive in 43 cases.

Both were negative in 41 cases.

TABLE NO. III.

Reincubation or reinoculation or both positive; subsequent negative, 16.

Reincubation or reinoculation or both positive; subsequent positive, 41.

Reincubation and reinoculation or both positive; no subsequent, 22.

Reincubation and reinoculation negative; subsequent positive, 41.

CONCLUSIONS.

1. These findings demonstrate conclusively the value of further work with atypical cultures.

2. As from the 242 cases, 120 came positive while 82 were proven negative, the chance of error, had a positive or negative result been reported at the end of the 15-hour examination, would have been great.

3. Both reincubation and reinoculation tests should be made as in a fair percentage of the cases but one of these cultures proved to be positive.

4. As in many instances a positive result was obtained after but five to seven hours' additional incubation, it is an advantage to make the 5 o'clock examination that the physician may have his report at the earliest possible moment.

5. It would appear that typical diphtheria bacilli may be so overgrown at the end of the ordinary 15-hour incubation as to practically disappear, the few remaining forms being atypical; this same culture or a transplant giving abundant typical forms on further incubation.

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* Apparent discrepency is not a real one as in a few instances original tube was positive at 5 P.M., but negative in the morning having been completely overgrown.

6. The diphtheria diagnostician must recognize in dealing with cultures for diagnosis that the associated organisms may be either symbiotic, neutral or antagonistic, and that while in a large percentage of the cases the diphtheria bacillus may be relied upon to outgrow the other organisms in 15 hours' incubation, there are a small number in which the associated organisms obscure the result at this time, the diphtheria bacillus appearing in large numbers either on shorter or longer incubation periods, depending on the nature of the growth of these organisms.

REPORT OF THE COMMITTEE ON STANDARD METHODS FOR THE EXAMINATION OF AIR*

The entire question of air examination,—physical, chemical, and bacteriological,—is in a highly undeveloped state. There are admirable methods available for the determination of temperature and humidity; and certain methods used in the analysis of air for carbon dioxide are of high accuracy. The estimation of dust particles and the enumeration of bacteria are, at present, on a less satisfactory basis. All along the line are differences of opinion as to the trustworthiness and limits of usefulness of particular procedures. There is no agreement as to the significance of the results obtained by a given method, and in some cases no standards are available for the interpretation of results. It is essential to the progress of that branch of sanitary science which deals with the atmosphere that these conditions should be remedied. Fundamental laboratory methods of high accuracy, and alternative simpler methods for practical use are urgently desired; the latter are as necessary as the former, but they should be standarized by the former, so that the extent of possible errors may be understood. The Committee has at present limited itself to a general review of existing methods of air examination, touching upon the following points:

A. Physical Determinations.

The most important properties of air, from the sanitary standpoint, are physical, rather than chemical or bacteriological. Disease bacteria may be carried at times by the air, and organic compounds, obvious to the senses, are unpleasant and perhaps dangerous. The commonest evil effects of bad ventilation are due, however, to high tempera-

* Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908

ture, high relative humidity, and dust. It is these points which particularly deserve careful and extended study.

1. Temperature and Relative Humidity. High temperatures and high relative humidity are recognized as the chief causes of discomfort in ill-ventilated rooms, aside from conditions which obtain in special industrial processes. These two determinations are therefore of prime importance in sanitary work. A calculation of the dew-point is often useful in addition to the temperature and relative humidity.

There are a number of reasonably accurate methods for determining the temperature and humidity of the air. Of these the sling psychrometer is the most accurate, but several forms of stationary wet and dry bulb thermometers are reasonably satisfactory for practical purposes.

2. Amount and Character of Dust. The common method of estimating dust in the air is to draw a measured volume of air through a filter of some sort and to determine the subsequent increase in weight. Soper suggests a filter of sugar, the sugar being subsequently dissolved and the dust filtered and weighed in a Gooch crucible. The number of dust particles present in air can be determined by Aitken's koniscope, which depends on the cloudiness produced by exhaustion of the air in a vacuum tube.

B. Chemical Determinations.

1. Carbon Dioxid: Numerous efforts have been made to develop methods of analyzing air for carbon dioxid, applicable to the varying conditions under which the inspector or sanitary engineer must work. Much remains to be done, however, in making these methods more exact, and in forming and in developing a logical and conservative basis of interpretation for the results obtained. In the great majority of cases the important comparison is between well and badly ventilated spaces. Other variables, such as temperature, humidity, and dust, of course affect the practical result. For the determination of carbon dioxid, working limits of

.2 to .3 parts per 10,000 with a possible maximum error of .5 parts gives a sufficient degree of accuracy. The ideal method is one which yields results as reliable as this rapidly and with easily portable apparatus.

The collection of the sample presents almost as many difficulties as the subsequent determination of the carbon dioxid contained therein. Samples may be successfully collected by a water syphon, by the use of a glass sampling cylinder fitted with a tight piston, or perhaps best by the steam vacuum method in which the sampling bottle is filled with steam by inverting over a boiling flask of water and when full of steam is stoppered with a vaselined rubber stopper. The sample is collected simply by removing the stopper.

For the final determination of carbon dioxid the Cohen and Appleyard method seems most satisfactory.

In regard to organic matter it is certain that in crowded rooms decomposing organic matter may be present, in such amounts as to affect the sense of smell and to produce serious temporary effects upon comfort and physical condition. No chemical methods are available, however, for the detection of the particular sorts of organic matter which are associated with such unpleaant sensations. The inspector may place considerable weight upon the evidence of his own senses in this regard. Air which smells bad is bad, for the reason that it smells bad. No analysis may be capable of showing its unpleasant condition; yet a trained investigator may be able to ascertain the cause of the unpleasant odor as soon as he encounters it.

C. Bacteriological Determinations.

1. Total Number of Bacteria. Very little has been done in late years in the study of methods for the determination of the number of bacteria in air. Most recent observations have been carried out by some modifications of the filter method suggested by Petri in 1888, or by the simple expo-

sure of plates of solid culture media. The latter procedure of course determines only the number of bacteria which fall on a given area in a given time rather than the number of bacilli present in air. Winslow has recently suggested a new method which consists in drawing a measured volume of air into a large bottle and allowing the bacteria to settle out on a layer of nutrient medium at the bottom. Comparative tests with this method and the sand filter method show that the filter method is reasonably accurate, if the sand grains be less than .3 of a millimeter in diameter, and the sand method is more convenient for work outside the laboratory than the culture bottle method. Weinzirl has obtained good results by bubbling air through a normal salt solution in a U-tube with a bulb at the distal ed.

2. Isolation of Specific Forms. The culture bottle method has been used with success for the isolation of sewage bacteria from air, measured samples of air being drawn into bottles containing dextrose broth, from which Bacillus coli and the sewage streptoccus may later be isolated.

It should be noted that the presence of acid-forming streptococci in air is of particular importance, since Gordon has shown that these organisms may be used as a measure of mouth pollution in inhabited rooms.

D. Conclusions.

This preliminary report is necessarily of a tentative and general nature. The Committee wishes, during the coming year, to collect such data on the details of various methods and their comparative value that a definite scheme of standard methods may be presented for the consideration of the section at the Richmond meeting. Such a scheme would naturally be left in the hands of the members of the section for a year more, before final adoption.

During the present year, the members of the Committee hope to carry out comparative tests of various procedures as far as time permits, but the assistance of other members

of the section is essential to success. In particular the Committee wants suggestions as to new methods, or details of procedure, or statements as to preference between alternative methods. This information is needed in the immediate future, as the work of the Committee must be completed by the summer.

C.-E. A. WINSLOW,
ELLEN H. RICHARDS,
JOHN WEINZIRL,
J. BOSLEY THOMAS,
G. A. SOPER.

Vital Statistics Section

PLURAL DEATHS IN FAMILIES AS AN INDEX OF THE FATALITY OF DISEASE *

By CHARLES V. CHAPIN, M. D.
Registrar of Vital Statistics, Providence, R. I.

It is very desirable from an epidemiological standpoint to determine whether the contagious diseases vary in virulence from year to year, and if so to what extent. For this purpose, case fatality rates are not usually very satisfactory. Thus the registration of the infectious diseases has been in vogue for only about twenty years or so, and yet it is desirable to know the true fatality as far back as mortality statistics have been preserved. Again, there is reason for believing that the registration of sickness has become progressively more and more complete. This, for instance, I suspect is illustrated by typhoid fever statistics in Providence. The apparent fatality of this disease was 51.0 in the years 1884-1887, the high fatality due probably to the failure to report cases. During the next five years, owing to attention drawn to this disease by pollution of the city water, the returns were more complete, and the apparent fatality was 30.4. During the five years, 1896-1900, the fatality was 23.7, and during the last five years 19.1. The use of the blood test has, I believe, done much to bring about the recognition of mild cases which formerly were not considered typhoid. It is possible then that the apparent fatality of this disease is no

* Read before the Section on Vital Statistics of the American Public Health Association, at Winnepeg, August, 1908

indication of its virulence, but the decrease may be due entirely to better diagnosis and better registration.

It occurred to me that in the absence of any better method, the frequency with which more than one death occurred in a family might be taken as an indication of the severity of a disease. It would seem that when a disease assumes a fatal form, plural deaths in a family ought to be more frequent than when the type is mild. But of course other factors do not always remain the same. Thus the size of the family may change. But such changes are usually quite small. Again improved isolation or removal to the hospital may prevent the spread of the disease. The influence of better isolation in the family in the majority of cases is not very great, and the influence of removal to the hospital can be calculated. Also improved treatment may have lessened the fatality as has undoubtedly been the case in diphtheria during the last dozen years.

An opportunity was afforded recently, in Providence, of testing the value of plural deaths as an index of virulence. For a number of years the fatality of scarlet fever had been low, as it has in most places. But, in the latter part of 1906 an outbreak began, at first confined to Italians, which showed a much higher virulence. For the nine years preceding 1906, during which the fatality was low, the average rate was 3.4, while in 1906 and 1907 it was 12.5; and during the six months when the outbreak was at its height, the case fatality was 17.2. Strangely enough, the fatality was rather lower among the Italians than among the other elements of the population.

During the years 1906-07 there were 17 instances where there were two deaths in a family, and four instances where there were three deaths, making in all 21 secondary or plural deaths. This was 11.8 per cent. of the 178 deaths. During the preceding nine years there were seven plural deaths or 4.7 per cent. of 149 deaths. The increase in fatality as

indicated by the plural deaths was from 4.7 to 11.8, while the increase as indicated by the case fatality was from 3.4 to 12.5. This seems to show that the number of plural deaths furnishes a crude, but only a crude means of estimating the severity of a disease. Perhaps if the figures were larger the correspondence might be closer. In 1887 the case fatality was high, being 18.04, and the percentage of plural deaths was 8.5. The case fatality was higher and the proportion of plural deaths lower than in 1906-7. But I know that cases of this disease were not nearly as well reported in 1887, and it may very well be that the disease was really not as virulent in 1887 as in the later outbreak. The mortality from scarlet fever was higher in 1856 than in any other year, there being 144 deaths, or 295 per 100,000 living. Of these 144 deaths 13, or 9 per cent., were plural. If our index is worth anything, it shows that in 1856 the excessive mortality was not due to excessive virulence but to an enormous prevalence of the disease.

During 1893-95 the case fatality of diphtheria and croup was 46.6 and the percentage of plural deaths 7.8. During this time the use of cultures and antitoxin had done almost nothing in Providence to affect the registration of the disease or to decrease the mortality. In 1896 the case fatality fell to 16.47, and the percentage of plural deaths to 6, changes probably due to the use of cultures and antitoxin. During the past seven years the case fatality of diphtheria has been 11.4 and the percentage of plural deaths 1.5. The fact that the ratio of plural deaths fell faster than the case fatality may be explained in two ways. It may be that the use of cultures has really cut down the volume of registration by eliminating follicular tonsilitis, etc., as some assume, but as seems to me improbable. And it may be that when a family has lost one child from diphtheria the effective administration of antitoxin to the others prevents secondary deaths.

In 1877 and 1878 there was an extensive outbreak of diph-

theria, the mortality being 332 and 278 per 100,000 living. The percentage of plural deaths, however, was 10.6, about the same as in the years immediately preceding the use of antitoxin. This seems to indicate that the excessive mortality in former years from diphtheria, as from scarlet fever, was not due to excessive fatality but to excessive prevalence, perhaps the result of the neglect of isolation.

ON THE LIMITATION OF THE APPLICATION OF THE THE CRUDE DEATH RATE IN DETERMINING THE HEALTHFULNESS OF LOCALITIES*

By S. J. BYRNE, M. D.
New York City

Before attempting, on the basis of the crude death rate, to pass judgment on the healthfulness of any particular locality, be it a village, city or rural community, we must first take into consideration the component parts that make up the population of that special territory, and the efficiency of the registration of deaths occurring therein.

We must first understand that the crude death rate alone is practically of little value. It becomes, therefore, necessary to put a limitation to its application. This limitation is based on the knowledge we may have or are able to obtain of the population with which we have to deal, and the conditions in which they live, as, for example, it would be manifestly unfair to pass judgment on the death rate of a city on the same basis on which we would accept the rate of a rural district, there being in the first case many occupational and other conditions that tend to shorten life that do not exist in the latter. It would likewise be well to remember the important part played in certain districts by large hospitals and sanitoria at certain localities. These localities are selected especially on account of their salubrity, and still the crude death rate would lead us to believe them very unhealthful, due to the fact that many who come to seek health delayed their search

* Read before the Section on Vital Statistics of the American Public Health Association at Winnipeg, August, 1908

too long, and thus added their large proportion to make a high death rate for a district otherwise exceptionally low. The effect of hospitals on the rate of a locality is well exemplified in the case of the old town of Flatbush. In this town, which showed an extremely low corrected rate, the crude rate was exceptionally high, due to the fact that the County Hospital, Almshouse and Contagious Disease Hospital, whose inmates practically all came from Brooklyn, were located within its borders, and the deaths within these institutions were charged to this otherwise healthful suburban territory. We should also place a limit on account of occupational conditions adding to the hazard of life and health and the class of population, whether made up largely of children or adults. Generally speaking, high birth rates are coincident with high death rates, on account of the high infant mortality, which raises the general rate, for with few exceptions we find a high rate of mortality among infants in all countries having a high birth rate. We should, however, remember that while a falling birth rate will materially affect the rate of mortality for the time being, on account of the smaller number of infants under a year old, among whom a high death rate is always to be expected, either on account of congenital defects or want of care and proper nourishment, later on this same falling birth rate will reduce the percentage of those who would be liable to reach the ages where ordinarily we expect low death rates to prevail, thereby increasing the rates not only at those particular ages, but the whole death rate as well.

We thus come to the conclusion that in eliminating these principle palpable causes, which have no bearing on the salubrity of localities, we must take these same causes into consideration and seek to find what bearing, if any, they have in the formation of crude rate, before passing judgment on the healthfulness of a particular locality.

Added to this limit, we must not overlook the all-impor-

tant question of thorough registration. Without proper registration all judgments based on crude death rates are mere guesses. In this respect I believe that every State legislature should be brought to see the importance, and I might add, necessity, of efficient and thorough registration of births and deaths, in conformity with a plan adopted by the General Statistical Office of the United States at Washingon after advisement with the representaitve statisticians of the various cities and states.

MORTALITY STATISTICS IN CANADA DURING THE PAST DECADE*

By CHAS. A. HODGETTS, M. D.
Chief Health Officer and Deputy Registrar General, Ontario

Naturally the decade chosen as the one for discussion in this paper is that intervening between the last two Dominion census, namely, for the years 1891 and 1901, when the population was found to be as shown in the following table:

POPULATION	1891	1901	Percentage increase or decrease of 1901
Total of Canada -	4,833,239	5,371,315	11. 1
British Columbia -	98,173	178,657	81. 9
Manitoba -	152,506	255,211	67. 3
New Brunswick -	321,263	331,120	3.06
Nova Scotia -	450,396	459,574	2.03
Ontario -	2,114,321	2,182,947	3. 2
Prince Edward Island	109,078	103,259	—5. 6
Quebec -	1,488,535	1,648,898	10. 8
The Territories -	66,799	158,940	130. 8
Unorganized Territories	32,168	52,709	63. 8

The increase for the Dominion as a whole was 11.1, the minimum increase being in Nova Scotia, 2.03 per cent,. and the maximum in the Territories which have since been made into Provinces, the tide of immigration being thither-

* Read before the Section on Vital Statistics of the American Public Health Association at Winnipeg, August, 1908

ward, while Prince Edward Island shows a decrease of 5.6 per cent.

As the system of classification of causes of death in the last census is that of Bertillion, the figures given permit of ready comparison with other countries where this is used. Regarding the completeness of the returns for 1901, the Chief Commissioner, Mr. Blue, states (Page 228, Vol. IV.) "It is well recognized that mortality returns of a census are never full. They are often ten per cent. or more below the actual deaths, as verified by local registration and other sources of information. Indeed no method of procuring mortality statistics is quite satisfactory," which statement is freely admitted, and continuing, the Commissioner gives his experience in respect to registration figures in Ontario, having compared carefully name by name those returned to the Registrar General of the Province with those collected by the census officers. The result of this painstaking comparison, as stated in the report, is briefly as follows: "For Ontario the comparison was very carefully made, name by name, and after striking out duplicates and the still-born, the total mortality for the census year in a population of 2,182,947 was ascertained to be 33,272. This is 6,243 more than the returns made by the census enumerators, and 3,244 more than the provincial records show, exclusive of still-born." The death rate for Ontario is 15.24 per 1,000. By reference to the census districts, page 230 and 231 of the Report, it is found that the discrepancies found ranged from 9 in the County of Frontenac to 391 in the City of Ottawa, while for the three districts comprising the City of Toronto they were—Centre, 145; East, 276; West, 327, respectively, or a total increase of registration over census returns of 748.

From this interesting comparison it is quite evident that in Ontario there were in the Census year, 3,244 deaths occurring which had not been registered with the Division

Registrars, as required by law. Naturally one would expect to find that the greatest discrepancies would have been noted in the less sparsely populated districts, where the Division Registrars are more inaccessible, and where small private burial grounds are often used, but of the total 3,244, the unregistered deaths in the large cities were as follows:

Toronto	748
Hamilton	194
Kingston	89
London	115
Ottawa	391

Showing that in the four principal cities of the Provinces, where the Medical Health Officer was authorized to vise every certificate of death before the permit for burial could be issued by the City Clerk, there was a discrepancy in the census year of 1,537 or 47.3 per cent. of the total number of discrepancies.

Carrying these figures for 1901 through the decade, it may be roughly estimated that there were at least 30,000 deaths which were not registered, and this in a population of less than two and one-quarter million, where registration has been in force since 1869, and there are nearly 900 divisional registration offices.

I say nothing of those provinces where the work is not so complete, but leave the reader to estimate the total number of unregistered deaths in the Dominion for the ten years, 1891 to 1901.

With the object to correct, if possible, this large discrepancy in the mortality returns of Ontario, the Vital Statistics Act, 1908, provides fully for the notification by medical practitioners of each death forthwith to the Division Registrar, and, where necessary for the convenience of the public, the Registrar General appoints sub-registrars, who are authorized to register the death—grant a certificate of reg-

istration or burial permit, forwarding, however, the original return to the Registrar of the Municipality or Division in which the death occurred.

A further provision is also made for the making of returns of all deaths quarterly to the Registrar General by all Registrars and sub-registrars, together with the original forms as received by the former. The cemetery authorities have also to make quarterly returns to the Division Registrars, who in turn forward them to the Registrar General, and, to complete the chain, legislation enacted in the Act respecting cemeteries will require that they must register with the Register General the name of the responsible party who is to make the quarterly returns, and, further, it will be made a punishable offence to bury in any cemetery or burial ground not registered in this manner. And in addition to these provisions I would urge the registration of all persons engaging in the business of an undertaker, requiring them to make quarterly returns of all burials made during the previous three months—and making the continuance of licenses largely dependent on their making returns to Division Registrars.

A study of the tables of deaths—numbers 1, 2 and 3, shows clearly that a great accuracy has been obtained throughout the whole Dominion in the registering of the correct cause of death. The number registered as of ill-defined causes in 1891 was 10,389, or 15.3 per cent. of the total, whereas in 1901 the number fell to 1,337, being a decline of 87.1 per cent., or only 1.6 per cent. of the total, which were really unstated or unclassified.

Of the other thirteen classes of diseases, the only one in which a decrease is noticeable is that of diseases of the Respiratory System, the decrease in 1901 being 13.1 per cent., the proportion being about equal for both sexes.

Of the groups showing an increase, the most marked was that of malformations, only four being given in 1891,

while in 1901 the figures were 254. Your attention is also directed to the increase in groups 11 and 12, where at the extremes of life it was found that in infancy the increase was 221 per cent., while that for old age was only 39.3 per cent. The latter is perhaps a natural thing, but the former clearly indicates in this country the slaughter of the innocents continues—a fact which clearly shows that women should be educated in their duties of motherhood before they enter upon these responsible duties, else forever we must look for a large death roll amongst the first-born of young Canadians as due to congenital debility, for while only 47 were directly attributable to neglect, yet upon the tombstones of the most of the remainder could be honestly written—"Due to ignorance on the part of the mother as to how to properly carry a child." No reference is here made to deaths occurring in the first year of life from other causes.

Any extended table of the classification of deaths by causes for the two years under consideration is not deemed necessary, chiefly from the fact that considerable discrepancy exists in the tables as adopted in the two years, that for 1891 being very incomplete as compared to the International which has been adhered to in 1901.

The following are a few of the interesting points found in the report and, for convenience, these will be discussed in the order of groups as given.

GROUP I.

Naturally, as a sanatarian one gathers up in this group the figures in reference to communicable diseases. For the six most common they are as follows:

	1891	1901
Diphtheria -	3,356	3,206
Measles -	794	1,029

Scarlet Fever	-	546	1,101
Smallpox	-	11	45
Typhoid Fever	-	1,592	1,909
Whooping Cough	-	756	1,086

In all of which diseases it will be seen there was an increase in 1901, with the exception of Diphtheria (including Croup,)—a condition which in the writer's opinion should not exist as regards Typhoid Fever, Scarlet Fever and Smallpox, if health authorities were fully alert to their duties.

THE AGES AT DEATH ARE SHOWN IN THE FOLLOWING TABLE

Age Group	Diphtheria	Measles	Scarlet Fever	Smallpox	Typhoid Fever	Whooping Cough
Under 1 year	677	334	159	6	59	678
1 to 4	1525	490	600	10	139	366
5 to 14	872	128	304	2	261	37
15 to 24	80	36	24	6	556	5
25 to 34	22	3	5	6	350	—
35 to 44	10	5	5	4	239	—
45 to 54	3	10	2	5	142	—
55 to 64	4	7	—	2	84	—
65 to 74	8	9	2	1	42	—
75 and over	2	1	—	2	21	—
Not given	3	—	—	—	16	—
TOTAL	3206	1023	1101	44	1909	1086

While Diphtheria carried off 95.8 per cent. before they reached the fifteenth year of life, yet the table shows that even those of the most advanced age group were not immune. Similarly Measles was most fatal in the same age groups, 93.1 per cent. dying before the fifteenth year of life, and a similar condition was found in reference to Scarlet

Fever, the percentage of deaths being 96.5 for the same age groups. The maximum number of deaths in each of these diseases occurred in the group 1 to 4 years, while in the case of Whooping Cough 62.4 per cent. of the deaths were reported in the first year of life. and none occurred after the 24th year of life.

Typhoid Fever claims victims at all ages, the smallest number, 21, being of the age "75 and over," and infants under one year to the number of 59 succumbed to it. The maximum was reached in the group 15 to 24 years, 29.1 per cent. of all deaths being from this disease.

The number of deaths from Cancer increased in the decade 91.2 per cent., 1,188 being reported in 1891 as against 2,272 in 1901. The distribution throughout the age groups is as follows:

Under 1 year	-	—
1 to 4	-	5
5 to 14	-	7
15 to 24	-	21
25 to 34	-	60
35 to 44	-	217
45 to 54	-	422
55 to 64	-	611
65 to 74	-	588
75 and over	-	337
Not given	-	4
	TOTAL,	2272

showing a gradual increase from the group 1 to 4 years until the 35 to 44 years group is reached, when the deaths were more than three times as many as in the preceding age group, the maximum occurring in those of the ages, 55 to 64. One-third of all the deaths, however, happened before the age of 55. The more extended study of Cancer

in the Dominion is certainly most important, and the governments should take up the question at an early date.

Tuberculosis of all forms caused the death of 2,220 more persons in 1901 than in 1891—a condition of affairs certainly worthy of the serious consideration of not only the Provincial Governments, but of the Federal legislators. In this relationship it would be interesting to know what percentage of this number of persons were recent immigrants to the Dominion. The most fatal period of life was that from 15 to 24 years, and 5,897 or 60 per cent. of the total number were of the ages, 15 to 44 inclusive.

Under 1 year	-	564
1 to 4	-	629
5 to 14	-	759
15 to 24	-	2512
25 to 34	-	2110
35 to 44	-	1275
45 to 54	-	828
55 to 64	-	543
65 to 74	-	349
75 and over	-	116
Not given	-	24
	TOTAL,	9709

The distribution of this disease in Canada is shown in the following table.

Tuberculosis in British Columbia	-	286
" " Manitoba	-	382
" " New Brunswick	-	539
" " Nova Scotia	-	911
" " Ontario	-	3544
" " Prince Edward Island	-	224
" " Quebec	-	3373
" " The Territories	-	400
" " Unorganized Territories	-	50
	TOTAL,	9709

The deaths from affections of the nervous system are upon the increase, the numerical increase being males,

1,340 and 1,362 amongst females, 4,014 of the deaths happening in children under five years of age.

GROUP III.

The increase with this group has been much less than in No. II, that of males being 808 and females 822 over 1891.

GROUP IV.

Owing to the very imperfect classification adopted in 1891, it is impossible to make any intelligent comparison of the various diseases. Apparently the deaths from pneumonia were recorded under Congestion and Apoplexy of the Lung, and where Pleurisy was placed is very difficult to say. It is gratifying, however, to note the decrease in deaths from diseases of the lungs and respiratory system, the decline for both sexes being 1,538.

The mortality in children under five years of age is marked, the deaths totaling 4,140 or 40 per cent., and of this number, 1,859, or 44 per cent., were due to pneumonia. Those of the remaining age groups until the 65th year of life is reached vary but slightly, 2,389 or 23 per cent. happening after this latter age, and of these elderly persons, 57 per cent. died of pneumonia—in all 5,679 deaths attributed to diseases of the respiratory passages were victims of pneumonia by slightly over 55 per cent.

	Diseases of Respiratory System	Pneumonia
Under 1 year	2398	1001
1 to 4	1742	858
5 to 14	590	302
15 to 24	532	373
25 to 34	473	361
35 to 44	535	375
45 to 54	629	447
55 to 64	823	557
65 to 74	1165	709
75 and over	1224	657
Not given	52	39
TOTAL -	10163	5679

It is not possible to make any comparison showing the months in which any of the diseases of this group were most fatal, but doubtless the severity of our winters has considerable bearing thereon.

GROUP V.—Diseases of the Digestive System.

The increase of the group of diseases for the decade was 31.3 per cent., and of the total number in 1901, 5,738, or 56.4 perc ent. were infants under one year—and 5,170 of this total were due to cholera infantum, caused no doubt mainly by improper feeding, chiefly something wrong with the milk which enters almost exclusively into the dietary of children of this age—figures which should be and could be reduced if health authorities were empowered to deal more forcibly with the question of a pure milk supply.

GROUP VI.

The incompleteness of the 1891 classification here again prevents of comparison being made except in so far as the total number of deaths is concerned, the increase being from 1,133 in 1891 to 2,123 in 1901. The deaths from Bright's Disease in the latter census were 658 males and 334 females—nearly one-half the group total.

GROUP VII.

With the improvements in the methods of ascepticism it is certainly a regretable fact that puerperal septicaemia does not appear in a better position than it does. The reflection is upon hygiene whether as followed out by the physician, the nurse or the public, I cannot say, but an increase in deaths from 70 in 1891 to 342 in 1901 is decidedly higher than it should be. In the age group of women under 15 we find 3 deaths recorded—while 17 were 45 and under 54, and one of the reputed age of 55 to 64 died of puerperal septicaemia.

Passing over the Groups VIII, IX and X, which call for little notice, we come to Group XI. This group relates

chiefly to deaths amongst the infantile population which are not classified elsewhere, and it affords a fitting opportunity for a brief consideration of this important aspect of the mortality returns. In Table No. will be found the deaths of infants under one year throughout Canada, by Provinces for the year 1901, under the different groups of causes of death.

The chief cause of death in the several individual diseases were as follows:

Measles - - - -	334
Whooping Cough - - -	675
Diphtheria and Croup - -	677
Influenza - - - -	460
Tuberculosis in all forms -	546

These being of the Communicable group. In the latter class, the males were 240 and females 306.

In GROUP II.—Simple Meningitis, 727 males and 550 females—a total of 1,277.
Convulsions—males 628 and females 473—a total of 1,101.

In GROUP IV.—Acute Bronchitis—males 261, females 132—total of 393.
Broncho-Pneumonia—256 for both sexes—and Pneumonia—891 for both sexes.

In GROUP V.—Cholera Infantum—5,170 for both sexes.

In GROUP XI.—There were 5,645 deaths of infants due to Congenital Debility, icterus and sclerema, and 580 to other diseases peculiar to infancy, and 43 of neglect, while

In GROUP XIII.—323 were reported as due to starvation or want of breast milk.

For the Dominion in the year 1901, of the total number of males dying (42,576,) 12,026 or 28.2 per cent. were infants under one year, and of the total of females dying, (38,625), 9,302 or 24.0 per cent. were under one year of age.

The Provinces with the largest number of infantile deaths, Ontario and Quebec, are represented in the following figures:

		Total
1891	Ontario—2993 males and 2336 females	5229
	Quebec—5613 " " 4400 "	10013
1901	Ontario—3740 males and 2957 females	6697
	Quebec—6523 " " 4926 "	11449

As the total numbers of both sexes who died in these years were 18,569 in 1891 and 21,328 in 1901, the percentages of the total number of infantile deaths for these Provinces for the two periods are as follows:

1891 Ontario—28.1 per cent.
1901 Ontario—31.4 per cent.
1891 Quebec—53.9 per cent.
1901 Quebec—53.6 per cent.

These figures indicate that in Ontario and Quebec, in 1891, 72 per cent. of all the infants dying in that year in Canada, died in those two Provinces, while in 1901, the percentage had increased to 85 per cent., and further, that the infantile death rate is about stationary in Quebec; while in Ontario it is on the increase.

GROUP XII.

The deaths in this Group are found in the following table, from which it will be seen that while 25.3 per cent.

of those dying of the ages 55 to 75 and over, were due to old age in 1891, the percentage in 1901 was 26.3.

	1891		1901	
	All Causes	Old Age	All Causes	Old Age
55 to 64 -	3993	45	5406	37
65 to 74 -	5223	641	6482	813
75 and over -	7647	3592	10877	5140
	16863	4278	22765	5990

Apart from senility the chief causes of death in those over 55 were

	55-64	65-74	75 and over
Tuberculosis - -	543	349	116
Cancer - - -	611	588	337
Apoplexy - - -	251	357	201
Organic Diseases of Heart	758	1144	779
Pneumonia - -	557	709	657
Bright's Disease - -	174	215	158

This unlucky number is very appropriate to this Group of causes of death, the figures standing 2,392 to 3,560—there being approximately one female to four males dying by violence, largely due no doubt to the hazardous occupations of the latter.

Of suicides there were in all 147—116 being males and 31 females.

This Group includes the deaths of 356 infants, due to starvation from want of breast milk—lives which possibly could have been saved had the parents known the proper use of milk for purposes of feeding their offspring.

That Our Lady of the Snows in her ice-bound winters is not so fatal to life, we note only 28 deaths from freezing, as compared to 49 from Sunstroke.

In this brief and very imperfect manner, endeavor has been made to epitomize the Mortality Returns of Canada, as taken from the Census Returns of 1891 and 1901, and to briefly refer to a few of the more important causes of death. With the establishment of the Census Bureau upon a permanent basis, under the able direction of Dr. Blue, we may expect the Census of 1911 to be more complete than that of 1901, and from time to time. I am sure, there will be issued from the Department bulletins replete with valuable statistical information and valuable deductions.

My chief object has been to impress on the public the importance from a sociological standpoint, the lessons to be learned from a statistical study of the deaths in Canada, more particularly as they relate to the deaths of infant Canadians. How many hundreds, if not thousands, of those lives could be saved annually if more attention was paid to the proper education of young men and women on the duties of fatherhood and motherhood, and setting forth a condition of affairs worthy of the careful consideration of the Federal and Provincial Governments who, if they would but devote one tithe of the sums of money at present appropriated annually for the study and care of animals to the more important one of human life and public health, particularly as it relates to our infant population, would, I am sure, be doing what this young nation requires and what is its just debt to generations yet unborn.

Municipal Health Officers' Section

PROBLEMS OF QUARANTINE IN CONTAGIOUS DISEASE WORK *

By FRANCIS GEORGE CURTIS, M. D.
Chairman Board of Health, Newton, Mass.

One subject which presents itself for careful consideration by health officers is the question of quarantine in communicable diseases. It is very important, not only because of the necessity of controlling as far as possible the spread of the disease, but also because in such work the health officer comes in close contact with the public and usually in a very disagreeable manner. It s no light matter for a man whose livelihood depends upon his daily work to have contagious disease break out in his household, and the object in view should be to have some method of control, which while effective shall also inflict as little discomfort as possible upon the household.

The question naturally divides itself into two heads; what shall be done with the patient, and what shall be done with the other members of the family during the continuance of the disease?

In regard to each of these questions there seems to be a great diversity of opinion, or at any rate of practice, not only in different States, but even in different localities in the same state; some communities seemingly believing that

* Read before the Section of Municipal Health Officers' of the American Public Health Association at Winnipeg, August, 1908

all that is necessary has been done when a warning placard has been placed on the house where the disease exists, while others enforce or try to enforce a strict quarantine of the whole family.

Such a variety of practice in a matter of such importance does not tend to impress the public with much faith in the efficiency of such work, and does cause a thinking man to wonder if the rules which he is instructed to observe are really necessary. Indeed, the writer has had a man call his attention to the fact that in the city where he had formerly lived, certain precautions which were being impressed upon him as important, were not required; and he wished to know why the same rules were not required in the same disease. A man who feels in that way is very likely to be lax in carrying out the rules which are laid down. It is with the hope that this section can and will formulate some uniform method of procedure which may be adopted, that the writer has ventured to bring up the subject.

Probably in the majority of communities some form of isolation in the severer forms of communicable disease is practiced, but the method as well as the degree of strictness is usually left to the local authorities.

In some places the patient is required in every case to remain in a room apart from the well members of the family; in others this isolation is not required but is recommended; and in some it is only enforced under certain conditions. Some cities place a card upon the door of the sick room, forbidding the entrance of any persons except "the attending physician, nurse and agents of the board of health." Others in addition require a sheet wet with a disinfectant solution to be hung before the door of the sick room.

In other places the sick person is only required to remain in the house, and is apparently allowed to mingle freely with the other members of the family.

Such are a few of the diverse requirements enforced in regard to the isolation of the sick person, and when we come to consider the length of time over which the isolation must extend the same diversity is found.

Of course the period of isolation varies with different diseases, but the length required for the same disease differs very much in different communities.

In many places the duration of isolation is left entirely to the attending physician in all communicable diseases, excepting perhaps in smallpox; in others the board of health fixes the period of isolation in certain specified diseases, and in all others it is left to the attending physician.

These periods of isolation where they are fixed seem to be as follows: in scarlet fever from three to six weeks; in measles from one to three weeks; and in small pox from certain definite periods which vary from four to six weeks, to a varying time defined as "until desquamation has ceased," or "until five days after desquamation is complete." In many other diseases the period is apparently left to the discretion of the health officer.

In diphtheria there is more uniformity of procedure and two negative cultures are usually required before the patient is released, although even here a slight want of uniformity appears in the fact that some cities require cultures from both the nose and throat, while others require it from the throat only; and some require the second culture to be taken by the physician to the board of health, while others do not.

The question of the time during which a child must remain away from school presents the same variety. Almost all States require by statute the exclusion of the child from the public schools during the existence of the disease. In some States a definite period must elapse after recovery before a child may return to a public school.

In Massachusetts this period was, until 1906, two weeks

after recovery from small pox, diphtheria and scarlet fever, and three days in measles. By a change in the law, made in 1906, the definite period was stricken out, and power was given to the local boards of health or the attending physician to issue a certificate allowing the child to return to school when all danger of conveying the disease has passed.

As a matter of fact many boards of health still retain a time limit, and many school committees have a regulation that no child may return to school after recovery from contagious disease without a certificate from the board of health.

This is at it should be, for the board of health and not the attending physician should be the judge of the fitness of the child to return to school.

In this very brief manner an attempt has been made to show the great diversity of practice which prevails in the method of treating the patient in cases of communicable disease, and when we consider the manner of treating the well members of the family in which the disease exists, or the other families in the same house, during the continuance of the disease, the same lack of uniformity is found.

In looking over the custom of the treatment of this part of the question we find that it varies somewhat with the disease.

Thus, in cases of small pox, yellow fever, and typhus, strict isolation of the family in which the disease exists is almost universally required and indeed, were it not required by regulation, the fear with which these diseases are usually regarded would in all probability compel almost complete isolation of the well members of the family.

In scarlet fever, diphtheria and measles we are again confronted with same lack of uniformity. In some cities the well children are kept in the house during the existence of the disease; in others they are allowed to go out without any apparent restraint.

The adults are usually allowed to go to work, but in such event are warned to be careful about coming in contact with the sick person when they are at home. Also where the adult's business brings him in intimate contact with children, as is the case with school teachers, or, in certain specified occupations, such as milkmen, bakers, and those who handle food stuffs, if he wishes to continue with his work he must leave the house where the disease exists.

In other places the well members of the family are allowed practically complete freedom as far as going about is concerned, but must not go to public places such as theatres and churches.

The other extreme is the rule found in certain cities that the well members of the family must be as completely isolated from the public as the patient himself; but it is very doubtful if such a rule can be enforced, especially in the more common diseases. In most States the well children of the family, as long as they remain at home, are excluded from the public schools during the existence of the disease, and for a certain specified time after recovery. In others they may return to school under certain conditions.

In Massachusetts, previous to 1906, the well children were rigidly excluded from school, as long as they lived in the house where the disease was present; and this, whether they had previously had the disease or not. In 1906 the law was made to read as follows:—

"A child who is a member of a household in which a person is ill with small pox, diphtheria, scarlet fever, measles or any other infectious or contagious disease or a household exposed to contagion from another household as aforesaid, shall not attend any public school during such illness until the teacher of the school has been furnished with a certificate from the board of health of the city or town, or from the attending physician of such person, stating that all danger of conveying such disease by such child has passed."

This allows a child who has had the disease previously to attend school provided the board of health is satisfied that the conditions are such as to make it safe for the child to go. It would be much better if the proviso about the attending physician were stricken out.

Nearly all the regulations, statutory or otherwise, apply to public schools, and it is the exception to find any rule in regard to private schools, although in one or two States they are specifically mentioned, as are also Sunday schools. In actual practice those in charge of private schools are usually willing to obey the rules of the board of health without any question, and see that they are carried out.

Persons who have been exposed to infection but who do not belong to a household where sickness actually exists are rarely, if ever, put under any restraint, although in some cities "exposed persons," either adults or children, must not be admitted to school, sometimes for a certain specified time and sometimes until the board of health has certified that all danger of infection has passed.

Such are some of the different methods which are used for the control of communicable disease, as shown by the regulations of local boards of health or by statute law; and if we should look into the details of the work, into the way in which these regulations are carried out when applied to individual cases, the variations would be still greater.

It is understood that it would be impossible in actual practice to apply a specific method of procedure to all cases, even of the same disease, because of the different conditions which are met with, such as the number of rooms in the house; the surroundings of the house; and the intelligence of the family; all of which must be taken into consideration. It would be worse than useless to attempt to apply exactly the same method of control to a case of scarlet fever occurring in a single house with plenty of available space, as

would be applied to a case occurring in a tenement with every room in use; but it seems that certain general rules of procedure could be formulated for the average case which could be modified slightly as might be necessary.

As most of the regulations spoken of are embodied in the rules of boards of health rather than in the statute law of the various States, there would be less difficulty in attaining uniformity as it would simply be necessary to change the rules of the local boards instead of the State law.

It is understood that it is impossible to fix a definite limit of duration for a communicable disease which will apply to all cases of that disease, but it is certainly possible to set a minimum limit of safety which could be increased in individual cases as might be necessary.

A long required period of isolation might inflict much unnecessary hardship in the majority of cases, and it would be much better to set a minimum which would be safe for the average case, with the understanding that it might be necessary to lengthen it in certain cases, rather than have a definite period of isolation which will cover the longest cases and compel shorter ones to remain in quarantine after it is safe to release them.

That it is not impossible to attain a large degree of uniformity in the method of handling cases of communicable disease is shown in tuberculosis, where the methods used in handling it show much greater uniformity than the methods employed in other diseases; and if this can be done in tuberculosis, which is in a way harder to handle because of the fact that there is practically no isolation, it ought to be practicable in diseases where isolation is required.

MANAGEMENT OF INFECTIOUS DISEASES IN RURAL MUNICIPALITIES *

By Dr. IRVING CLEGHORN
Baldur, Manitoba

In the rural municipality the conscientious health officer is the hardest worker, poorest paid, and most abused of all public officials. In order to do his duty he must turn a deaf ear to public opinion, as he is sure to be severely censured by many and commended by few.

It is a difficult task to make the public understand where the work of the health officer ceases and that of the physician begins, particularly as is the case in most rural municipalities where the health officer is also physician.

This position I have held for a number of years, and during my term of office have had some experiences, a few of which I shall refer to under the following headings:—

The Home, The School, and The Community.

In the home the chief difficulty is the tendency of the people to conceal rather than report a case of infectious disease, on account of their fear of quarantine, and it sometimes happens that unless some member of the family becomes seriously ill, no doctor is called and the contagion may spread to other homes before anything can be done.

There are various reasons why the public object to quarantine: Some on account of business, others because their children may be kept from school, while the greater number consider it an unnecessary expense, thinking children should have all these diseases during childhood. Therefore,

*Read before the Health Officers' Section of the American Public Health Association at Winnipeg, August, 1908.

I believe the principal reason is, that the public is not sufficiently educated to the standard of sanitary knowledge. They think every man's house should be his castle, and can see no reason why even the health officer should interfere with their private life. They do not realize that the welfare of the home is to a large extent the welfare of the community and that one unsanitary home may be the source of infection to the entire district.

Sometimes a neighbor, fearing for the safety of his own family, reports a suspected case, whereupon the health officer has to perform the painful duty of almost forcing his way into the home, getting little else for his trouble than a clear conscience and the ill-will of the family, which, as a rule, they give generously, sparing nothing.

Thus you see the health officer must forego personal interest in order to do his duty to the public.

With regard to the school: Strange to say I find from personal experience that a very large proportion of the children attending public schools suffer more or less from some physical defect which, if taken in time, may be cured, but neglected forms the starting point of serious disease.

It therefore becomes almost necessary in the the interests of the children that the health officer should visit the schools at least twice a year. Errors of refraction should be noted and immediately corrected. Examine the mouth for carious teeth; these often cause disordered digestion and render the child susceptible to disease; also examine the nose and throat for adenoids; enlarged tonsils form the breeding ground for germs, while the adenoid growth decreases the lung capacity, thus rendering the child susceptible to tuberculosis.

During the past year our Province has been greatly interested in the selection of a suitable site for building a sanatarium, and providing in other ways for the treatment of tubercular diseases. But the old saying is very true, "An

ounce of prevention is worth a pound of cure," double true in this instance. Then why not take proper provisions for the prevention as well as the treatment of this "White Scourge," as it has been rightly termed.

A great many of our pupils are mentally dull, simply because they are physically handicapped; and although shelter is provided for the homeless waifs off our streets and money generously contributed towards supplying their material wants, still there are hundreds of our public school children today whose mental inactivity is caused by some simple physical defect, which might be remedied if taken in time.

Granted some parents attend to all of these things, but the majority neglect them through want of thought or education along this line. These things may seem trifles, but we must remember that "Trifles make perfection," and we should aim to have our children both mentally and physically as nearly perfect as it is possible for humanity to be.

If the country depends on the rising generation, surely our government should spare no expense in order that our boys and girls may grow up fully equipped and prepared to fight the battle of life successfully.

Referring to the community, among the many duties which may be mentioned are: inspection of back yards, alleys, closets, and stables, proper disposal of all refuse and debris, perfect drainage and a wholesome milk and water supply; also simple epedimics of measles, mumps, chicken pox, whooping cough, etc., which though trivial, offer considerable difficulty owing to the fact that we have the strong prejudice of the people to combat and must act tactfully to insure the best results for the public safety.

In infectious diseases, however, which are more directly fatal, as diphtheria, scarlet fever, smallpox, etc., we must be more rigid in our procedure; and in outlying districts not having hospital or modern facilities, we can only resort

to the machinery of the law and make the best of the means at hand.

I might briefly describe one instance in which I had an outbreak of smallpox, principally among the halfbreeds and in Rock Lake District, where I had to occupy the position of health officers as well as physician.

On my first visit of inspection I found ten cases in seven homes, and inside of the next nine days fourteen more developed among the suspects, making twenty-four in all.

The district covered an area of eight square miles, containing eleven infected homes and necessitating a drive of from ten to eighteen miles for me on each visit.

I vaccinated all those exposed and immediately placed the whole settlement under quarantine in charge of three efficient constables whose duty it was to rigorously enforce the law, and to see that the wants of the inmates were properly supplied, although the government makes no provision for this.

At the close I personally supervised the cleansing and disinfecting of all homes—result, on death, with no further outbreak.

Now as the health of the community depends largely on the efficiency of the work done by the health officer, he should be a specialist in his line, thoroughly educated in sanitary science. In his case, "A little learning may well be a dangerous thing"; therefore, in order to devote his time and best energies to this wide field of labor, he must be well and suitably paid. Few men in this western country can afford to be philanthropists, and we country doctors, no matter how good our intentions may be, have not the time or means to devote to this particular branch of study.

The people of Manitoba are awakening to the fact that Agricultural Science has hitherto been a neglected branch of learning. A college has been built where well-paid professors are ready to instruct all those who may wish to

study farming from a scientific standpoint. If only we could arouse a like interest in sanitary knowledge so that the people would work hand in hand with the health officer to exterminate germs and prevent the spread of infectious diseases, instead of either opposing or calmly ignoring his best efforts, how much more good might be accomplished.

For this reason I would strongly recommend a union of municipal health officers, to meet annually, for the purpose of discussing ways and means and to give and receive help from knowledge gained by hard-earned experience.

I am very pleased to see these four great countries joining forces, so that by their combined efforts they may more firmly establish the foundation on which to build the great truths of Sanitary Science.

THE DISINFECTION OF ROOMS*

By B. R. RICKARDS †
Columbus, Ohio

Some months ago the writer had occasion to collect statistical information regarding disinfection as carried on in the larger cities of the United States.

To this end a circular letter asking for information on various points was addressed to the Boards of Health of all cities in the United States of over 100,000 population. Answers were received from 29 cities and on these replies this paper is based.

Of these cities but five are now using generators alone, four others use a generator but combine it with other methods either occasionally or always, nine cities use the permanganate method alone and three others use permanganate combined with some other method. Nine use some form of solid formaldehyde—proprietary articles sold under various names, but five of these nine cities combine this method with some other to a greater or less extent.

One city uses a combination of formaldehyde, aluminum sulphate and quicklime; two cities use spraying only; two use spraying occasionally; one uses sulphur only; one occasionally, the former not believing in formaldehyde. One uses the sheet method and three use it occasionally.

So much for the methods employed—the striking features being the diversity of methods and the large percentage

* Read before the Section of Municipal Health Officers of the American Public Health Association at Winnipeg, August, 1908

† Written while Director of the Boston Board of Health Laboratory.

which use the solid proprietary forms, about which they evidently know little except what the agent has told them.

Of the 28 cities using liquid formaldehyde, by whatsoever method, nine or practically one-third buy it on analysis, one other formerly analyzed but does not now; two buy it on guarantee but do not analyze. The remainder trust to the honesty of the manufacturer; one city—evidently buying in small quantity—relying on the label on the bottle.

Seven cities appreciate the value of added humidity. One man on the other hand states positively that he does not deem it advisable.

The time of exposure varies from 3 to 24 hours, the majority requiring the room to be closed from 6 to 8 hours.

All the cities replying seal the rooms. Gummed paper is most commonly used but various other materials are employed. One city uses adhesive plaster, another adhesive tape; two cities use wet strips of newspaper; three others plug all cracks with cotton, paper or rags.

Seventeen cities test the results of disinfection by exposing cultures in the rooms, nine doing this as a routine procedure; the remainder occasionally or at stated intervals.

The cost of disinfection for 1000 cubic feet of space appears to be somewhat difficult to calculate, one city placing it as low as 7 1-2 cents. The average cost is probably in the neighborhood of 15 cents, but as some evidently count only the cost of materials without the labor, while others reply on a basis of so much per room, no reliable data can be given at this time. One city places the cost as high as 70 cents per room.

The amount of formaldehyde used per 1000 cu. ft. varies from one oz. of the solid material to 32 oz.

From the above compilation one fact stands out strikingly —each city is proceeding on a go as you please policy, adopting that method which happens to suit the immediate situation best from a standpoint of convenience and expense, regardless usually of the question of efficiency.

Chapin, in an article on the "Fetich of Disinfection," has called attention to the fact that disinfection was formerly a religious ceremony and that the attempt to give it a scientific basis was an afterthought. He has indicated that in the majority of instances infection comes from direct contact and not from formites and states that in his opinion disinfection has little value in preventing the spread of the common contagious diseases and instead of being a benefit is a powerful factor in preventing sanitary progress by encouraging belief in discredited theories.

Hill would modify this somewhat sweeping statement by limiting disinfection to chronic infections with a high mortality such as pulmonary tuberculosis, leprosy, etc., or where particularly active organisms with unusually high resistance such as anthrax are concerned.

Be our opinions what they may, it seems apparent from a review of the situation that in many cases it is impossible to conceive that the disease organisms are killed by disinfection as often as practiced. If such be the case, then, as Chapin suggests, immunity from recurrent cases comes because infection is not often carried this way. The writer's experiments, so far as they have gone, bear out this theory in many instances.

The present situation is intolerable viewed from a scientific standpoint. If disinfection is of value in any case then it hould be done in an efficient manner; a manner proved by exhaustive work to be reliable. If disinfection in general is not of value and can be proved to be of little or no value in any given disease, then disinfection in that case should be abandoned and trouble and expense thus saved.

Those of us that have carried out many experiments on disinfection, appreciate that there are many factors involved. Hill enumerates several, among them sufficient gas for a sufficient time, leakage, amount of wind, rapid evolution of gas, humidity, etc. By the omission or change of one of these the results obtained are changed. In other words, it is possible

to obtain almost any result if proper care is not taken in regard to the factors involved.

The amount of work involved in a proper solution of the problem is enormous, more than one man or a few men can hope to do.

By the formation of this Section a way is opened by which something of a start may be made. The first thing indicated is a consideration of the practical problems involved by municipal health officers,—a consideration of what is and what is not necessary in the way of disinfection.

By this means an enormous amount of laboratory work can be eliminated. After this is done it may be possible for the laboratory men by experimentation to lay down rules by which efficient work can be done with such diseases as the executive health officers may deem necessary. Provision should be made by the executive by which experiments may be carried out under very carefully controlled conditions,—then as in bridge and structural work a margin of safety can be applied and efficient work guaranteed.

Present conditions are farcical. Let us as technical men take some step toward the amelioration of such conditions.

THE PLEASURES AND HOPES OF THE HEALTH OFFICER *

By C. V. CHAPIN, M. D.
Health Officer, Providence, R. I.

Abstract.†

The paper refers in a light vein to the multifarious duties and small pay of the health officer. He is told that he must work for duty's sake, and for the pleasure of working, though sometimes unexpected recognition may be received. The health officer is to perfect himslf in his art, and to keep up with his science, and most of all is to do something, however small, to advance that science.

* Read before the Section of Municipal Health Officers of the American Public Health Association at Winnipeg, August, 1908
† Published in full in the Journal of the American Medical Association. Vol LII, Page 686 (Feb. 27. 1909)

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1, 2, 3, 4, 5—see bottom page 372.

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THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH

APRIL QUARTERLY MEETING

Boston, Mass.

The quarterly meeting of the Massachusetts Association of Boards of Health was held at the Brunswick Hotel, Boylston street, Boston, Thursday, April 29, under the Presidency of Dr. H. P. Walcott.

Upon the recommendation of the Executive Committee the following members were elected:

Charles Harvey Morrow, M. D., of the Gloucester Board of Health.

William Y. Fox. M. D., of the Taunton Board of Health.

William T. Jeffrey, of Salem.

A. L. Grover, M. D., of the Hyde Park Board of Health.

L. E. Young, of the Milton Board of Health.

William H. Spaulding, of the Leominster Board of Health.

E. G. Sherman, of the Mansfield Board of Health.

C. H. Stearns, of the Mansfield Board of Health.

E. Marion Wade, of Boston.

Michael Kelly, M. D., of the Fall River Board of Health.

Stedman Bixby, Ph. C., of Boston. Bacteriologist for D. Whiting & Company.

Edward B. Bigelow, M. D., of the Worcester Board of Health.

Arthur S. Hartwell, M. D., of the Norwood Board of Health.

Edward Knobel, of the Dedham Board of Health.

Edward A. Andrews, of the Cambridge Anti-Tuberculosis Association.

Howard F. Holmes, M. D., of the State Hospital, Tewksbury.

Report of Committee on "Appeal from Boards of Health."

The Committee appointed at the January meeting to oppose House Bill No. 690, on "appeals from boards of health," promptly met and arranged to go to the hearing. Philip S. Parker, Esq., a member of our Association, was engaged as counsel. All the members of the committee attended, all spoke, as did also Mr. Parker and a member of the law department of the City of Boston. There was a full and free discussion. The hearing resulted in success for the opponents of the bill, and the petitioners for the bill were in due time given leave to withdraw. No substitute bill has been offered, nor is any likely to be.

H. LINCOLN CHASE, Chairman,
LEWIS M. PALMER,
CHARLES E. A. WINSLOW,
Committee.

Report accepted.

Report on Committee on "Exposure of Foods."

Mr. President, The committee appointed to formulate regulations concerning the exposure of food stuffs, has carefully considered this question and submits the following regulations for your consideration. It is not the opinion of the Committee that these regulations should replace others where they exist but rather that they be used as a basis for regulations by boards of health of other cities and towns.

"No meat, poultry, game, fish, dried or preserved fruits,

dates, figs, cherries, grapes, berries, cut fruits, cut melons, cracked nuts, candies or confectionery shall be kept, carried, sold or offered for sale in or near an open window or doorway, outside of a building, or in any street, private way or public place of —— unless they be properly covered so that they shall be protected from dust and flies. No vegetables or other articles which are to be used as human food shall be kept or placed, or exposed for sale where it is possible for dogs or cats to befoul or otherwise come in contact with such vegetables or other articles of food.

"Every person being the occupant or lessee of any room, stall, building or place where any meat, fish, birds, fowl, milk, vegetables, butter, fruit or other articles intended or held for human food shall be stored, kept, sold or offered for sale, shall put and keep such room, stall, building or place and its appurtenances in a clean and wholesome condition."

Respectfully submitted,
FRANCIS H. SLACK, Chairman,
A. W. PACKARD,
HERBERT C. EMERSON.

Report accepted.

COW FAECES AS A SOURCE OF TUBERCLE BACILLI IN MILK

JAMES O. JORDAN, Bureau of Milk Inspection
B. L. ARMS, Bacteriological Laboratory
Boston Board of Health
Boston, Mass.

During 1908 an investigation was made, which was necessarily limited by reason of lack of time, as to the presence of tubercle bacilli in the milk and faeces of tuberculous cows, and in separator slime obtained in the commercial separation of cream from milk. The condition of the cows in the latter instance was, of course, unknown. This is offered as a preliminary report, and it is hoped later to continue the work.

The existence of tuberculosis in dairy herds, the fact that many animals, which react with tuberculin, pass tubercle bacilli with their faeces, and the present but abhorrent contamination of a large percentage of milk with cow faeces, were the causes which led to this inquiry. The specimens of faeces and milk were from cows which had all reacted to the tuberculin test. Reliance for results was placed wholly upon inoculation of guinea pigs. Sixteen specimens of faeces from as many cows, and five samples of milk from five of these cows were obtained. Subsequent to the procuring of this material, these animals were all killed, and in only one instance did the post mortem examination fail to reveal tuberculous conditions. In one cow no lesions were discovered, and the owner was indemnified for her loss. No evidence of tubercle bacilli was detected in the faeces of this animal.

Of the sixteen samples of faeces, four showed positive

evidence of the presence of tubercle bacilli; and included in the number which gave negative results, was the specimen from the above mentioned cow, where upon post-mortem examination no lesions were discovered. Eliminating the specimen from this animal, and taking as a basis for calculation the fifteen samples, where tuberculin test and autoposy indicated tuberculous conditions, 26.66 per cent. of the faeces samples contained tubercle bacilli. It must be borne in mind that only one specimen was procured from each animal. The post-mortem examinations showed generalized tuberculosis in three of the animals, and in the fourth cow, disease of the mediastinal gland was indicated. None of the milk samples gave positive results for the presence of tubercle bacilli, but this result was not unexpected; the milks were drawn under precautions which precluded faecal admixture, and contamination of tubercle bacilli could have occurred only through the udder. It would be both unwise and unsafe to draw any inference from the results upon the milk specimens, other than that these milks were free from tubercle bacilli. One of these samples was drawn from the cow, where the post-mortem examination showed no lesions. Speculation and generalization based on these findings, as to all milk from tuberculous cows being free from tubercle bacilli, would be fallacious.

Separator slime* is a grayish repulsive appearing mass, which collects around the bowl of centrifugal machines during the separation of cream from milk.

Nine of these specimens were subjected to examination by guinea pig inoculation, and of this number, three, or 33.33 per cent. were contaminated with tubercle bacilli. This is a somewhat higher percentage of positive findings

* A chemical examination was made of one or two of these specimens, and the results obtained follow:

No 1—Total solids, 27.02 %; fat, 2.75 %
No. 2—Total solids, 33.44 %; fat, 2.77 %; ash, 4.29%

than that shown by examinations of other investigators of slime, obtained elsewhere; but there is substantial agreement that† "about one fourth" of all the separator slimes from the commercial separation of cream are contaminated with tubercle bacilli. But not all of the tubercle bacilli, in the separation of cream from milk, go to the sediment. Many bacilli are removed with the cream, and Shroeder and Cotton* conclude that when they are present in milk, they will be present in greater concentration in cream."

The conditions shown by these examinations of faeces and slimes, and which accord with the results secured in other investigations, present a serious problem, and one requiring energetic action and co-operation of and support of the public. The exact manner in which the milk, from which the slimes were obtained,, was infected, is a question of minor importance. But the contamination was probably either through the udder, or from cow feces containing tubercle bacilli; and the fact that a large proportion of milk contains varying quantities of this filth,, demonstrates that this latter is a cource of infection to be feared.

Naturally this danger is increased in proportion to the number of tuberculous animals in herds, which are contaminating their feces with tubercle bacilli. Lack of cleanliness in barns, or dirty habits on the part of milkers would also be factors of importance.

Considering the large percentage of tuberculous cattle, and the probability of milk products being infected with tubercle bacilli, a question of grave import is presented, and one which has an important bearing upon the welfare of the public.

Regardless of controversies as to whether or not human beings contract tuberculosis from bovine sources, no one,

† Report of the Secretary of Agriculture, Washington, D. C., 1907, p. 30.
* Tubercle Bacilli in Butter, Circular 127, Bureau of Animal Industry, p. 4.

whether consumer, or scientist maintaining the negative of the above proposition, would knowingly use milk from tuberculous animals. Consequently the presence of tubercle bacilli in milk and milk products is one of vital interest to consumers, and while doubt exists in the minds of some, as to danger to the public from milk contaminated with tubercle bacilli, the latter should have all the protection, which it is possible for human agencies to devise.

These results emphasize the importance of clean milk, and the necessity of eliminating all cows reacting to tuberculin from dairy herds. But to a city of the size of Boston, and compelled to depend upon other States for a large portion of their milk supply, the problem presented is one not readily solved. Even if all the milk necessary to supply Bostonians was produced within the State, any attempt at legislation, compelling the employment of the tuberculin test and the cleansing of herds of reacting animals, would develop tremendous opposition on the part of owners of dairy herds. The correctness of this assertion cannot be gainsaid, and yet the difficulties as above outlined would be minor, as compared to the actual conditions of the present day, with milk coming to this city from at least five States outside Massachusetts. If this State legislated against tuberculous animals, such action would not compel the removal of animals similarly affected from herds located outside the State. To keep milk from tuberculous animals from entering the State is possible, but it is not a feasible solution of the problem, not at least until consumers are willing to forego, for a time at least, much of the milk now required daily.

The situation has more than one serious aspect. It affects most vitally the consumer, but considering the large percentage of tuberculous cows and the financial investment therein, the interests of the farming community cannot be eliminated from the final solution of the problem. But the interests of dairymen are minor as compared to the con-

sideration for the public, the welfare of which is of vastly more importance than the money issue.

It is questionable also if too much leniency has not been shown farmers in the matter of tuberculous animals, and if it is not a mistake to continue to idemnify them, as is now being done. This system of payment by the State has been followed for many years,, and cattle owners have meantime had an opportunity to become educated concerning the subject of tuberculous stock; but there is no sound reason for the indefinite continuation of the indemnifying plan. In fact there seems to be good grounds to assume that farmers are more lax concerning the purchase of cattle, less observant of proper stabling conditions, and are not as much concerned over the care of their stock, as would be the case, if the loss for tuberculous animals had to be borne by themselves? Has the time not arrived when the State should discontinue the idemnifying policy?

In this connection Dr. Theobald Smith* asserts that "the cattle owner raises his tuberculous crop each year, to be shouldered and paid for by public taxation. The only way to make any progress after these many years of patient compensation for diseased animals, is for the State to make them without compensation."

Would it not be better to devote the money now paid to farmers for tuberculous animals, to the application of the tuberculin test to all dairy herds, the loss for animals deemed dangerous to fall upon owners? There can be no more rapid or efficacious manner of preventing the purchase of animals not known to be healthy, and of obtaining the necessary sanitary surroundings, such as light and ventilation for the non-tuberculous stock, than that suggested. Farmers who once suffer a loss in this manner, will be careful to avoid further outgo for the same reason.

* The channels of Infection in Tuberculosis, Together with Some Remarks on the Outlook Concerning a Specific Therapy. From Transactions of the Massachusetts Medical Society for 1907

The policy for the State has been a mistaken one, in that its oversight has been directed to the pocket book of the cattle owner, rather than to the health of the consumer.

Federal action may be required to suppress the tuberculous cow as a source of food products for interstate commerce, but the all powerful factor necessary to produce the required legislation, whether federal or State, is the tremendous power of public sentiment. With that, and there is no question of greater importance to enlist the concern of humanity, than that of clean milk from healthy animals, the regulation of this important matter would be greatly simplified. Agitation of this vital question must continue until public opinion is sufficiently arroused to give the movement the necessary impetus.

Meanwhile to give protection to the public from the tuberculous cow, regardless of the manner in which milk may be infected, requires the pasteurization of milk products, excepting only raw milk drawn from herds shown to be free from tuberculosis by the tuberculin test, and which is produced under methods satisfactory to Boards of Health. There is every desire to avoid the sensational, but is it not the part of wisdom, while there is a possibility of danger from the tuberculous cow and from milk-borne epidemics, to invoke every known means to avoid that danger?

But such pasteurization must be properly performed, and the degree to which the milk is heated, and the duration of heating, must be sufficient for the destruction of the tubercle bacillus and other pathogenic organisms. Such treatment of milk should be by methods approved by health authorities and under their immediate control, and they should have power to destroy milk not properly pasteurized. In other words, let the pasteurization be efficient, or keep the product away from the public. This milk should be sold only in bottles, and the latter should bear a label stating the date upon which the milk was heated, the degree

of heat employed, and the length of time that the heating was continued. This milk should be delivered so that the bulk of it could be consumed within twenty-four to thirty-six hourse of the time that it had been heated. Milkmen may deem these propositions obnoxious, but those dealers unwilling to be thus regulated, had better cast their fortunes in other lines of business. But protection of public health is good business, and those who cater to their trade upon lines which give the consumer the most protection, are the ones destined eventually to win the largest financial returns. There is no sound reason, however, why those who are willing to conduct their business upon proper methods, should find oversight irksome.

But pubic concern in the suppression of the tuberculous cow should not be lessened by reason of milk supplies being pasteurized. The heating of milk should be viewed only as a temporary makeshift, and one to be discontinued as soon as the exigencies of the situation warrant such action. The freedom of milk from all excreta is a prime necessity. Clean milk from animals, not only free from tuberculosis, but from other bovine diseases, should be insisted upon, and every effort directed towards obtaining it. When this condition exists, the question of heating milk will be of secondary importance.

The procuring of the samples of faeces and milk was due to the courtesy of Dr. Austin Peters, Chief of the Cattle Bureau, Massachusetts State Board of Agriculture; and the examinations of the above material as to the presence of tubercle bacilli were made in the Bacteriological Laboratory of the Boston Board of Health, the laboratory at the time being under the direction of Mr. Burt Ransom Rickards, whose cooperation made this investigation possible.

DISCUSSION

DR. PETERS. The trouble in dealing with the problem of bovine tuberculosis is one of money. The Legislature grants an annual appropriation of $70,000 for the outside work of the Cattle Bureau and $7,000 for the office expenses. Out of the larger appropriation I have to pay agents for attending to other diseases as well as to tuberculosis. Agents have to see horses with glanders and investigate outbreaks of hog cholera and outbreaks of rabies, and agents have to be paid for examining cattle that are tuberculous. About all that can be done under present conditions is to try and give the State as good a system of inspection of the cows in the dairy herds of the state as we can, based on the physical examination.

Local inspectors of animals quarantine or owners report to us about—well, I won't say how many are reported, but the results of the agents' examination every year is that about 1700 to 1800 tuberculous cows are found that show physical evidence of disease or that have nodulated udders and are really the animals of greatest danger to the public health. The last few years I have gotten the appraisals down. I have trained the agents so that they cut the appraisals down pretty well, so that we pay only about $21.50 a head on an average for the cows. This costs about $35,-000 to $38,000 a year that is paid to cattle owners, and there is usually a deficit in my appropriation, which is made good by the next Legislature. So it is hardly fair to say that it takes more than half the appropriation to pay for the cows, because I most always have a little money appropriated at the end of the year to make up a small deficit. I should think it took half of the appropriation that I have, counting the deficiency appropriation, to pay for the cows. Of course there are regular customers, who have cows condemned each year, and then there are other farmers, who occasionally have a cow taken and then

perhaps go two or three years or longer without having another taken, and under present conditions I think it hardly seems fair not to indemnify owners of cattle for their cows. The time may come when it would seem better not to pay for cows that show physical evidence of disease, but I don't know that it has arrived yet.

I think there are about 250,000 head of cattle in Massachusetts, and when you consider that only about 1800 bad cases are found that are condemned by the Cattle Bureau every year, it is only a fraction of one per cent., after all, of all the cattle in the state; considerably under one per cent. of the cattle that are of a kind to be much danger to the public health.

This work of Dr. Jordan's is very interesting, and I think there is no question but what the principal source of dissemination of tuberculosis in stables is through the faeces. It is only occasionally that a cow is found with a tuberculous udder, through which the bacilli are given directly off in the milk, but the ordinary way in which milk is contaminated is through the faeces. Cattle do not cough up and expectorate as humans do. A cow, if she coughs, brings material from her lungs up into her throat, and then swallows it, and it passes off through the intestinal canal. Consequently, where a cow has an open cavity in the lung and is bringing up material from the lung containing millions of tubercle bacilli, these bacilli are passed off with the faeces, and when the cow lies down she gets her tail in the gutter behind her, and when she gets up she whisks off flies and she smears more or less filth on her flanks. Then when this dries the milker sits down to milk, if the cow is not properly cleaned off, and particularly if the pail is an open one, the dry particles of manure drop into the milk and in this way it becomes contaminated. I think by killing off the cattle that show marked physical evidence of disease, or that have nodulated udders, that the

public health is protected in the greatest measure. It may leave some animals that are sources of danger, but they are less a source of danger than the bad cases.

The objection to testing everything with tuberculin is that a great many animals would be killed that might have only a small localized lesion, animals that had not come to a point where they would be a danger to the public health or to other cattle, and if the farmer did not thoroughly disinfect his stable, if he did not take pains to buy tested cows in the future, or if he got a little careless and perhaps saw a good looking cow that was not tested and bought her, as they often do when they originally intended to buy tested cows to replace those condemned, in a little while his herd would have as many animals in it that would react to a tuberculin test as in the first place. Until this work can be done in a way to obtain permanent results there is no use in testing cattle with tuberculin and killing reacting animals, when in two or three years the state would have to do the same work over again in the same stables. I think if this work was going to be undertaken it would require a good deal of money, a great many animals would be killed because of some slight local lesion that were practically sound, that the State would have to pay for, and ought to pay for, and that if permanent results are to be obtained the State would have to do the whole thing, that is, the farmer could not be trusted to disinfect; the State would have to have a disinfecting corps to disinfect the cattle stables as well as men to examine the cattle and test them and kill them. A very close supervision would have to be kept over the farmer in the future to be sure that every cow he had was a tested cow, and the State would have to test his herd every year, and then perhaps some day the inspector, much to his surprise, might find a lot of cases of tuberculosis through the disease having gained access to the herd again in some way.

While tuberculosis is as prevalent amongst bovines in this State as it is now, it would seem that unless work could be undertaken on a large scale and a great deal of money spent it is better to continue the present methods. All the cattle that are brought into Massachusetts from without the State are tested, a great many of them at the Brighton market every week, about 14,000 head a year are tested at Brighton, and some of these cattle that were held and killed were the ones from which Mr. Jordan obtained his material. If farmers could only come to a realization that when they take a tuberculous cow out of the herd they ought to thoroughly disinfect the stable, and when they go to Brighton to buy a new cow they would take pains to buy a cow that is tested instead of any good looking cow, I think greater progress would be made in the process of diminishing the prevalence of the disease than is being made at present. This is a campaign of education. Some farmers are intelligent enough to avail themselves of the benefits of this system, and others are not.

The PRESIDENT. The Association would be glad to hear the practice in other communities. We will ask Dr. Chapin what they do in Providence.

Dr. CHAPIN. We are not very far advanced in the work of checking bovine tuberculosis in Rhode Island. There are very few cattle condemned, and, as I said before, a great many tuberculous animals are imported into the state and a good many of them are slaughtered and eaten.

Professor SEDGWICK. Mr. President, I came in late and so missed the pleasure of hearing Dr. Jordan's paper, but he told me in advance what he was going to say. It may interest the Association to have just a word on what is being done at the moment in Chicago. There is a lively dis-

turbance on in that particular section over this same question.

Dr. Evans, the health officer of Chicago, is a very energetic person, and he startled people, I think it was six or eight months ago, by getting an ordinance passed, or at least by establishing the rule and seeking to get an ordinance passed,—I am not sure as to the exact legal status of things at the moment,—which provided that all milk brought into Chicago should be from tuberculin-tested cows, or if not from such cows, that it should be pasteurized under municipal supervision. There was of course a great disturbance on at once, and there is a more or less unfortunate clash between Dr. Evans and other health officials at the moment in regard to it. The matter I believe is still in the hands of a committee, but in the meantime Dr. Evans is going right ahead, and I heard him read a paper a few days ago, in which, as I remember it, he stated that already 60 per cent. of the milk of Chicago either comes from tuberculin-tested cows or from pasteurizing plants under the supervision of his officers, and he predicted that by the end of the year 90 per cent. of it will be derived in that way. This has been, as I understand it, a very interesting controversy, but Dr. Evans is apparently coming out on top. The thing is moving ahead well, and the people of Chicago, and many of the people of the state of Illinois outside Chicago, are earnestly backing up Dr. Evans I heard a well-known sanitarian of Chicago, whose opinion I value highly, say that he thought Dr. Evans was the most efficient health officer they had ever had there, and that he was supporting him in every particular; and in another part of the state, quite remote from Chicago, I got the same opinion from men of authority in agricultural matters and in matters of tuberculosis.

To show the need of something of the kind I may say that the herd of the University of Illinois, a herd kept on

the Agricultural College farm, which provides milk for the people in the cities of Urbana and Champaign, was tested a little while ago, and although supposed to be perfectly sound, out of 50 cows 19, as I remember it, reacted clearly. Experiments were then made on the dung and on the milk of these cows, and on their butter, and tubercle bacilli were proved present in all three,—in the butter to a rather surprising extent. They have excellent workers there, excellent bacteriologists and excellent agriculturists. As nearly as I got the trend of opinion, though I did not specially go into this matter, public and expert opinion ran very much along the line of Dr. Jordan's paper, namely, that we ought to work for tuberculin-tested animals, and in the meantime, as it would be obviously impracticable to get such animals at once without very great hardships upon the farmers, that we ought to prevent hardship upon the consumer by pasteurizing milk which has not been derived from herds properly tested. From all that I gathered I infer that within a year, possibly considerably sooner, the city of Chicago will be acting along these lines, and if so it will be a very interesting experiment to see what happens to the infant mortality and other conditions, hygienic and sanitary, of that city during the coming year. Personally, I believe that Dr. Jordan is quite right in this matter, and that we shall never get through with this thing unless we do adopt pretty radical measures some time and live up to them. It is always easy to put off the evil day. I don't say that the day has arrived at this moment, but I think it is high time for us to consider whether we are doing in Massachusetts all that we ought to be doing in this direction, so that I hail with satisfaction the ideas which Dr. Jordan has brought forward.

WHAT IS DISEASED MEAT AND WHAT IS ITS RELATION TO MEAT INSPECTION?

By PROFESSOR THEOBALD SMITH
Boston, Mass.

There has been recently discovered, more or less accidentally, a law among the statutes of this Commonwealth which has been interpreted as prohibiting the sale of meat from animals affected with local disease of however slight a character. This law is in conflict with the long-standing, well-tried and reasonable regulations of the United States concerning meat destined for interstate traffic. Under these circumstances I have been asked to introduce here a discussion on the text of disease and its relation to the inspection of meat. While turning the subject over in my mind I came to the conclusion that a general statement of the principles which should control the meat traffic would perhaps serve our purpose better than a discussion of a few kinds of affections which are specially hit by our present law. These can be taken up in the subsequent discussion by others.

The subject is in its larger bearings essentially a question of waste versus economy. The discovery of waste and its utilization marks many epochs in our material progress. We are everywhere beginning to see waste towards which we have been blind hitherto. To discover it means to utilize it. The enlightenment of any nation or community may be measured by its adjustment of means and ends to one another. If there is much waste in attaining a certain

end, intelligence is low, for human ends defeat themselves through loss of energy and resources.

Science furnishes us the insight needed to accurately adjust means and ends to each other. If science is worth anything to civilization it is in creating new values, making new classifications, transforming crude into more refined distinctions and leading us from emotional to rational states of mind which enable us to reconstruct the material world for better uses. Our present civilization is largely constructed out of what our savage forebears thought worthless, and in each successive step man has taken up something ignored or rejected by his predecessors. Without this process of readaptation and re-discovery advance would be impossible.

While science is building up, there is going on a continual tearing down, and our onward movement is measured neither by one nor by the other process, but by the difference between the two. It is often difficult to decide which process is more active. It is becoming evident on all sides that through unmeasured waste of resources, we have been exhausting our material capital, whereas we should be living only on our income. A sense of obligation to our posterity which also is a measure of enlightenment should induce us to come down to our income as soon as possible.

Unfortunately, the method of equalizing losses through insurance of various kinds, pensions, and taxes, shuts our eyes to the fact that every time property of any kind is destroyed by fire or otherwise it is absolutely lost. The community and the nation are by so much poorer. We have irrecoverably lost so much capital.

Among our material resources our food supply represents both capital and income. It stands for capital in so far as we are withdrawing the nutritive elements from the soil in the food we raise without always restoring them to the soil in some other form.

Flesh foods are among the most expensive of our food products. They represent the concentrated energy of vegetable foods made over by the animal body. During this transformation there is much loss of energy, some of which in the best kind of agriculture is promptly returned to the soil as fertilizer to maintain soil fertility. The modern world is addicted to the use of flesh foods. The great uninhabited territories of the western hemisphere have furnished for many years a rich supply to the entire world. This source is slowly drying up as agriculture takes up the land and gradually the raising of food-producing animals will have to become diffused and form an integral part of agriculture everywhere. In other words we shall have to look for a developing, local, domestic supply as is the case in European countries.

The influence of such a change,—from the great herds and flocks of the far West to the small numbers on the small farms everywhere—on the incidence of animal diseases will be marked. The great collections of animals on the prairies and uplands have been relatively free from disease. Few, if any, animals have been introduced there. The movement has been chiefly outward. Hence the chance for the introduction of disease has been slight. Parasitic diseases have been common in places, but the great plagues, unless indigenous and perpetuated in the soil, have been absent.

The domestic animals on the ordinary farm are in a somewhat different situation. There is more intercourse among the farmers and more movement among the animals themselves. This is especially true among dairy herds. Farmers while attempting to improve their stock often introduce infectious diseases. The country fairs and shows contribute much to the dissemination of animal plagues. The farm animals are furthermore subject to various accidents and to minor ailments, because they are overfed, overbred, and

underexposed to the healthful influences of air and sunlight. They are not so treated that the vitality of the species is likely to remain on a level. It will surely decline and even if we finally succeed in suppressing one plague, such as tuberculosis, another will in due time take its place to thrive on the unnatural conditions, unless we replace them by such as are more normal, physiological.

In view of the many possibilities of disease, both infectious and non-infectious, which the future has in store for our food-producing animals, we must therefore strive to maintain as far as possible the physical integrity of our domestic animals both by preventing infection and by raising their natural resistance to disease. In the meantime we must determine as far as possible through scientific means what pathological states of animals are dangerous to human health when the flesh is used as food. This is a complicated problem, for there are inextricably interwoven in it sanitary, esthetic and financial considerations, more or less in conflict with one another.

Taking first the sanitary aspect as the most important, let us endeavor to define under what conditions animals yield diseased meat. Here we must distinguish at the outset between diseases which are infectious, i. e., due to bacteria or animal parasites, and those which are not. Among the infectious diseases we must make a further distinction between those which are and which are not transmissible to man. Constitutional diseases not referable to infectious or parasitic agents are relatively uncommon, for our food-producing animals are as a rule killed at an early stage in life before decrepitude or the diseases of declining life, so common among human beings, have a chance to show themselves. I shall therefore refer to such diseases only casually. We are really concerned with infectious and parasitic diseases, for infections usually seize upon diseased states. They move in when health moves out and they

usually terminate life by grafting themselves on pathological conditions.

An examination of the field of animal pathology shows that we actually have few ideally healthy animals. It is hardly to be expected that we should have. The abnormalities encountered are of many kinds, ranging from the mere carriers of germs to various stages of local and general disease. Thus we find in the mucus from the throats of animals, bacteria which kill rabbits and guinea-pigs inoculated with this mucus. If we should inject a syringeful of blood from a healthy cow in the Southern States into a cow living in our own State, we should produce an infectious disease probably fatal. In the intestines of animals are found bacilli of tetanus and botulism and malignant oedema. In the winter infectious skin diseases may be seen on cattle otherwise in good condition. In certain regions actinomycosis of the jaw and tongue or even of the udder is not uncommon. Most cows after they have reached a certain age will show signs of recent or old tuberculosis.

Again animals not infrequently suffer from injuries which open the way for bacteria. Cows are apt to swallow pieces of baled-hay wire, hair pins, safety-pins, nails, etc. In some cases these pierce the walls of one of the stomachs and produce foul-smelling abscesses in the immediate neighborhood of this organ. Sometimes the infection extends to the liver. I have seen pieces of baled hay wire in various stages of migration from stomach to heart. Some years ago there were reported cases of cancer of the nictitating membrane of the eyes of cattle due probably to injury of some kind. Remains of pneumonia and pleurisy, peritonitis, former fractures of ribs and limbs are not uncommon. Animal parasites are usually present in the walls of the stomach and intestines and elsewhere. There is probably not a cow in existence which does not have

sarcosporidia in its muscles, filaria in abdomen or blood. The variety of such parasites increases as we approach warmer climates.

If therefore we should reinforce the naked eye examination with the microscope we should find still fewer ideally perfect creatures. None of the conditions I have mentioned would be considered harmful or objectionable with a sane, rational meat inspection service in operation.

Among the infectious and parasitic diseases which are transmissible to man we may mention anthrax, glanders, rabies, foot-and-mouth disease, tuberculosis, septicaemia and pyaemia, paratyphoid infections and trichinosis. The flesh of animals affected with these diseases is not known to be dangerous to man after thorough cooking, if we except those affections due to the group of paratyphoid or paracolon bacilli. This statement has a broad historical basis, for, in centuries past, flesh from animals thus affected was frequently or even regularly consumed. Each disease has to be considered by itself if we wish to single out and define the danger to man. The real danger in such diseases as anthrax, rabies and glanders lurks in the handling of the carcass and the uncooked meat by unsuspecting purchasers and in the further dissemination of the specific infection. Hence all traffic in any or all portions of carcasses affected with these diseases is prohibited and the slaughter of animals in which such diseases are recognized during life is forbidden for obvious reasons. Trichinous pork is harmless to manipulation, but highly dangerous as an uncooked food. Certain infectious diseases of animals not transmissible to man may be highly contagious to livestock in general and traffic in infected meat is forbidden on this account.

Perhaps the two animal affections which have caused the greatest harm to man through the food are trichinosis and various septic diseases of cattle associated with typhoid-

like bacteria. Trichinosis is eliminated by boiling the meat, but boiling has not in all cases destroyed the dangers arising from the second group of infections.

Passing from these acute, generalized, infectious diseases, to the localized, chronic types we reach a borderland between the so-called normal, healthy or sound, and diseased meat.

For example, actinomycosis may remain localized in some part or organ situated more or less superficially and the animal persist in a normal state of nutrition. The local affection may nowise disturb the physiological activities. In tuberculosis the earliest lesions are situated in lymphnodes associated with lungs or mesentery or throat or all combined. But the condition of the animal may be excellent. Where a rational meat inspection service exists such animals are considered sound and for good and sufficient reasons. Only where such localized diseases have overstepped certain well defined bounds, may we entertain a suspicion that perhaps the meat might not be absolutely free from the bacteria of the disease.

Of all the primarily local affections which may attack our cattle, tuberculosis seems at present singled out for the sharpest attack. Yet of all the localized diseases, there is none which is less objectionable to me than cases of primary tuberculosis of slight or moderate degree as sources of beef. The more localized a disease and the slower its progress, the better protected are the other organs through a slow development of immunity. The animal body is a large and complex community and disturbance in one place does not mean a general panic. Diseased conditions may thus be represented by gradations from the slightest local to the severest general disorders; from the most harmless to the most dangerous types of generalized disease. In any case the danger is greatly reduced, if not destroyed, by cooking. The danger in handling the un-

cooked article also varies according to the bacteria or parasites involved. With such a complicated situation before us it is obvious that it cannot be simplified by resorting to a town meeting vote, but must be treated scientifically.

Turning now to aesthetic considerations, we may maintain that it is disagreeable to think of eating the flesh of any animal which had the slightest blemish anywhere. Perhaps it is, but under the domination of this feeling we are better off to cast our lot with vegetarians. It is often easier to school our common sense and reason in such matters than our instinctive feelings. They usually win the victory. Such feelings, however, are possessed in widely different degrees by different nationalities. For example, horse flesh is used extensively on the continent of Europe. In Saxony, dogs are slaughtered for food.

Peculiar and contradictory conditions prevail in different countries, partly as a result of certain ingrained customs and habits. Pork is not inspected for trichinae in this country because it has at no time appeared very necessary to do so to protect public health against these parasites. Yet now and then cases occur and autopsies and dissections have shown that up to 5 per cent. of human beings in our country have been infected at one time or another. On the other hand Germany has established an extensive inspection service to detect trichinous pork, since more pork is consumed there than beef. The reason for this extensive service, which included in 1904 28,000 employees, is found in the fact that pork is frequently consumed uncooked. Severe and highly fatal epidemics have occurred which made this protective machinery necessary.

Contradictory customs and habits prevail among civilized nations with reference to bacteria themselves. I stated above that probably very few bona fide disease germs are dangerous when eaten in cooked foods. Yet there is a

tendency to go to extremes to avoid the possibility that any infection may be contained in the flesh even though such infection unheated may be absolutely harmless to human beings. On the other hand we take up to 1-2 million bacteria per cubic centimeter or 15 million per ounce in milk. Here we find microbes of all kinds and sizes, and of various shades of pathogenic and toxic power. We eat large numbers of bacteria in raw oysters during April, September and October of the open season. We seed our milk with lactic acid bacilli and incubate it so that billions may develop in it for curative purposes. Finally we ourselves are no strangers to bacteria. They occur on all mucous membranes and they make up about 1-3 the weight of the dried contents of the large intestine. They have even become beneficial under certain conditions. The subcutaneous injection of dead bacilli of various diseases promises to become an important means of not only increasing our resistance to disease, but even of curing us of persistent, longstanding, bacterial affections. Some years ago von Behring höped to obtain from cows highly immunized against tuberculosis by the injection of the products of tubercle bacilli, milk which through its protective antitoxins might become a valuable curative agent. The hope has not yet been realized.

These illustrations will suffice to show that our objection to meat coming from animals not perfectly sound or healthy, leaving aside those diseases transmissible to man—is largely based on esthetic rather than on sanitary considerations and that our daily actions are hopelessly contradictory.

As a result of this state of affairs we find the inspection of meats governed by different regulations in different countries. Thus the meat inspection laws of Germany are far less exclusive, but at the same time more highly developed and worked out in minuter detail than in any other country. Diseased meat is there defined solely in accord-

ance with its potential danger to the health of human beings and to other still healthy domestic animals. Meat is classed as utilizable, non-utilizable and of inferior grade. A fourth class is created which is utilizable only under certain restrictions. These are that it be sold after sterilization, at a lower price and only in small quantities to any one purchaser. A certain percentage of animals which the U. S. inspector now condemns is utilizable in Germany. A larger percentage which he condemns is utilizable there under the restrictions mentioned. It having been learned that the flesh of animals affected with various types of pneumonia is harmless and not reduced in nutritive value, such flesh is classed as utilizable. About 1 per cent. of all animals are slaughtered because affected with diseases which induce the owners to dispose of them. If after inspection no reason exists for imputing any harmful qualities to the flesh, it is sold either with or without restrictions according to the nature of the case. I might give other examples of the operations of the German law, but they will suffice to show that the grading of meat is based on harmlessness and nutritive value, and that it is determined by rigidly scientific means. Moreover medical history has demonstrated through great self-imposed experiments of the human race in earlier times that flesh from most diseases is harmless if eaten after thorough cooking.

Coming now to our own situation, the question arises, where shall we draw the line? Who shall define it? What rulings will redound to the advantage of the masses of the people? These questions are difficult to answer. They involve individual and racial prejudices and grave financial problems. Any answer whatever presupposes in the first place thorough inspection of all meats destined for human consumption by trained inpection.

A set of complicated meat inspection regulations can be handled only by scientifically trained inspectors. The reg-

ulations are based upon what we know of the usual course of the disease, the behavior of disease germs within and without the body of the affected animal, their capacity for producing toxins, the nature of these toxins, and the natural immunity of the various tissues of the animal. No one but a well-trained veterinary graduate can be trusted to interpret such regulations. It may be stated truthfully that most intelligent, experienced butchers can distinguish normal meat from low-grade abnormal meat. They can tell whether an animal has diseased parts or organs, but there their usefulness ends. They cannot be expected to recognize localized tuberculosis for example and differentiate it from the generalized or advanced stages. Their judgment would be of little value in distinguishing local suppurative from general septic conditions. The trained inspector's function is to save meat wherever that can be done, rather than to reject it. The process of rejection is easy enough. It does not require technical training. It would not take long for one skilled in judging form, consistency and color to detect the ideally healthy animal. But there would be little meat handled and sold after his inspection if every minor blemish were counted against the animal. This is not what we can afford.

With the aid of trained inspectors it would be possible to satisfy various groups of people by classifying meat as is now done in Germany. The healthfulness of the article sold should be guaranteed by municipal, state or national inspection and the quality defined in accordance with other standards. It can then be left to the buyer to decide whether he wishes beef from ideally sound animals according to our present Massachusetts law at $1.00 to $1.50 a pound, or the article as passed by U. S. inspectors at 30 cents perhaps. He should also be permitted under certain restrictions to buy beef from animals, certain organs or parts of which have been rejected as diseased at say 12 cents

a pound. He should even have the opportunity to buy sterilized meat at 7 cents if he wishes it. Though we may be still some distance from the point where meat will be so classified and sold, yet I think we are moving toward it. With the growth of the domestic live stock industry we shall be forced to follow the older countries who have had to work this problem out for themselves. Without educated inspectors this cannot be done safely.*

A rational meat inspection service is the best which veterinary medicine can give to practical life. Some of the most conspicuous German veterinary scientists started as meat inspectors. It gives material for a life-long study of diseased conditions. The inspector, like the physician, must always be prepared to meet hitherto unknown pathological combinations. One who inspects animals reared in New England has much to learn if he should be transferred to the South, or to the West. Each territory has its own disease problems in addition to the common, universal ones.

In the final shaping of our meat inspection the economic or financial aspect of the whole problem will be of no small importance. It is obvious that the strictness with which animals locally or slightly diseased are eliminated from the meat supply will eventually be governed by the law of supply and demand. When we are very hungry we are much less squeamish about our food than when our tissues are continuously supersaturated with the daintiest that can

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* That our national regulations are not perfect is shown by the following exemption of farmers' products :—"Section 14. When any cattle, sheep, swine or goats have been slaughtered by any farmer on the farm, and the carcasses, parts of carcasses, or meat products thereof are offered to any common carrier for transportation from one State or Territory or the District of Columbia to another State or Territory or the District of Columbia, the common carrier may so transport such carcasses, parts of carcasses, or meat food products as long as the same may be identified as of animals slaughtered by any farmer on the farm."

The shipper is required to certify that such meat products are "sound, healthful, wholesome and fit for human food," etc. How "any farmer on the farm" is always able to tell us that his animals were sound, wholesome and fit for human food is somewhat beyond my comprehension. This section must be classed among those clauses which occasionally find their way into our laws and which seem to suspend the operation of the entire law in which they appear. This is evidently a sop to "the farmer on the farm." If such products were to be consumed by the farmer himself or in his household, it might perpaps be unreasonable to compel him to submit his products to inspection.

be supplied. If our meat supply becomes a diminishing quantity our laws will sooner or later relax and we shall come down more and more to the question of healthfulness irrespective of other considerations.

A rational meat inspection law will also aid the farmer in improving his stock and weeding out unsatisfactory animals. If we should exclude entirely from the market beef from cattle affected with primary tuberculosis of the lymph nodes or other organs in early or arrested stages, it would prove a serious obstacle to any further purification of our dairy herds from this disease. If the owner finds that all animals reacting to tuberculin are to be condemned as unfit for food, he will think twice before undertaking the complete elimination of tuberculosis. While we may be taking tubercle bacilli in raw milk we are vigorously opposed to the barest suspicion of having to take a stray dead bacillus in cooked beef. With a proper inspection the chance of any infection of the meat in the cases mentioned is extremely small, and the chance of any human infection from this meat infinitely smaller.

In the final adjustment we shall also learn that with a growing domestic supply of animals destined for food, public abattoirs will be necessary to properly carry out the regulations pertaining to the safeguarding of flesh foods. Small communities will have to band together and build sanitary slaughter-houses and forbid the use of small, private, usually filthy, killing places. Only in large municipal plants can well-trained, well-paid inspectors be fully utilized. The cost of properly inspecting numerous small establishments would be prohibitory and such inspection would have to be consigned to untrained, incompetent hands, with the result that the safeguarding and proper valuation of the product would be highly unsatisfactory under any law. It will be claimed that any attempt at classifying meat products will fail because lower grade meats, like

oleo-margarine, for example, may become the means of deception, misrepresentation and fraud. It will also be claimed that the people will refuse to buy lower grade meats. The first objection can, I think, be met by carefully limited sales. The second claim will probably prove to be unfounded if the healthfulness of the meat is safeguarded by a non-political, rigidly civil-service meat inspection force. Until that time comes we are all of us likely to eat at some time or other third-class meat, brought at first-class prices, even under a drastic law.

On the whole we have no moral right to withhold a valuable food product because there stands in the way certain popular misconceptions. Our esthetic sense is purely subjective, depending on individual and racial characters. It would be autocratic to attempt to embody in statutes the attitude of the most fastidious. Individuals should be free to choose and not be burdened by the subjective prejudices of others. In the case of our milk supply, standards based on nutritive values are becoming insignificant as compared with hygienic standards; so with meat, the nutritive and esthetic values will have to give way to standards measuring freedom from disease-producing elements. I do not mean that we should not establish and enforce standards of nutritive values, but they must not be permitted to overshadow the steadily growing importance of hygienic standards forced upon us by the increasing complexity of every-day life.

In conclusion let me summarize the principles I have endeavored to bring before you as follows:

1. There are few animals either ideally sound or wholly free from disease germs or parasites.

2. The line to be drawn between normal and suspicious or infected meat is not absolutely fixed, but depends on the nature and stage of the disease process.

3. In very few diseased conditions would the thoroughly cooked meat if eaten produce disease in man.

4. Animals affected with certain diseases are rejected in toto because the handling may infect man or disseminate the disease. Animals affected with other diseases are rejected partly because our general standards of healthy meat are relatively high, partly because such diseases may be disseminated by the meat and infect other animals.

5. The proportion of harmless meat from diseased animals excluded from consumption in the future will probably depend more or less on the relative scarcity of meat. With the shrinking of supplies we may eventually approximate the regulations now in force in Germany which permit a larger freedom in the use of meat from diseased animals than we do.

6. Proper inspection demands well-trained inspectors and these are most economically employed in large public abattoirs.

7. To utilize our meat products most efficiently they should be classified and meat from certain diseased animals now rejected entirely should be sold under suitable restrictions after sterilization.

DISCUSSION

DR. DURGIN. This paper and discussion have been brought about for the purpose of showing to all parts of the State a condition in meat inspection of the State which calls for a speedy remedy. We have two laws on our statute books concerning the inspection of meat; one enacted in 1898 is sensible and in keeping with the best scientific conclusions of the day; the other, enacted in 1908, on account of bob veal and for the prevention of cruelty to animals, was never intended for the purpose to which it has recently been forced, though its provisions are susceptible of the interpretation recently given by the Attorney General of the State, and which has thrown the local meat inspection service into a most ridiculous situation. This later law should be modified or stricken from the statute books. It is hoped that you will all take this matter seriously, and do what you can to favor a change in the present conflicting and humiliating state of our meat inspection laws.

DR. BURR. The practical side of the question, is that of the enforcement under the Board of Health's direction of this law as interpreted by Attorney General Malone. I, unfortunately, have been obliged to carry out the orders of the Board of Health, which were that Attorney General Malone's decision should be strictly enforced. We have strictly enforced it at the abattoir and we certainly have been placed in a very ridiculous position. If any one doubts that point, those of you whose duty it is to carry out this law in other parts of the State will agree with me, if you do your duty and enforce it.

I have brought with me a few figures, showing the results of about a month's work under this present law. During the month of April, we have condemned twelve

animals which would have been condemned under the old law, amounting to about 6,000 pounds of meat,—I mean the larger animals, cattle. Under the present interpretation, we have condemned thirty, making a total of about 20,000 pounds of meat, a difference of between 6,000 and 20,000 pounds under the old law and the present law. With hogs, we have had about ninety animals which have been condemned, only six of which would have been condemned if we had been working under the previous law, making a total in pork of a difference between 700 and about 15,000 pounds. The total result would be something like this; we have had 120 animals which have been condemned under the present law, 18 of which would have been condemned under the previous laws, and under the previous laws 6,000 pounds of meat would have been condemned, whereas we have condemned about 36,000 pounds of meat.

Now, it is interesting to know also what result it had upon the amount of killing. During the month of April, 1908, there were 2,511 cattle killed, 15 of which were condemned, with a total weight of 6,238 pounds. During the corresponding month of 1909, there have been only 1,100 cattle killed, with the condemnation of 42, and a weight of about 26,000 pounds. In the hogs we have had a difference in weight during the same month of between 900 and 15,000 pounds of pork. You can see that there is an immense drop-off in the number of animals killed, and also an immense increase in the amount of beef condemned.

I was very much interested, of course, in Dr. Smith's paper, and I hope that some of his views may be embodied in some resolution which might be transmitted to the present committee which has in hand this question of changing the law.

Mr. Jordan, in his paper, spoke of the use of tuberculin. I want to say a word in regard to that. He believed that milk from tuberculin tested animals only should be used

and if the milk of animals not tested with tuberculin is to be used, it should be pasteurized. It seems to me that the use of tuberculin with the idea of exterminating tuberculosis has been very much over-rated. I agree with Dr. Smith that the popular idea of eradicating tuberculosis by one injection of tuberculin a year is certainly wrong. When you consider the period of incubation in animals, of from a few hours, possibly, to a month, if you were to test a herd with tuberculin, and some of those animals were in the incubation period, of course you would get a negative reaction, and the result would be that you would leave those negative reacters, and some time later, perhaps the next year, in testing your animals, you would find those negative reacters giving a positive reaction. I think that is the reason why it is almost impossible to eradicate tuberculosis from herds in a practical way, and, as Dr. Smith says, you have got to retest your animals at least once in three months and even then carry out strict isolation.

PROFESSOR SEDGWICK. This whole controversy is a very entertaining one, and to anyone who is familiar with the history of sanitation there is nothing particularly new in it, at least to this extent:—it is not the first time that sanitation has been used as a political club. Germany, for example, for the sake of "protection," has at times been very careful about the importation of American hog products, and at other times, when less eager in that direction, been very much less careful, if I remember rightly. And we all recall the water-gas controversy, in which sanitation was dragged in by the ears to protect the health of the people, so long as it served a certain gas company to keep another one out. But when the two companies got together and divided up the spoils, then sanitation was forgotten. So that we all want to be pretty careful, and not be used as clubs to pummel somebody with. Sanitation is a beautiful

subject, but when it is prostituted to political purposes it becomes very much like other political things.

I did not rise, however, to say this so much as to say that I am very glad that Professor Smith has put the whole subject on what seems to me to be the true biological plane. I honestly believe that the food problem for this country is going to be in the next 25 years a very serious problem. It is certainly a sinister fact when, during hard times, food prices are rising; and when we remember, or stop to think, how a combination of bad crops in this country and in Argentina, or in one or two other countries,—a combination that might very easily happen,—would be very likely to bring us all pretty near the famine point in regard to our food supplies. If we look at the soaring prices of wheat, recently, (and some of us are not at all persuaded that these are wholly due to the manipulations of one man), I believe that Dr. Smith has sounded a timely note in saying that we have got to give heed to our food supplies; and that we have got to be very careful how we get into the habit of rejecting meat which can be shown to be fit for human food, simply for aesthetic or possibly political considerations.

Of course the greatest discovery, or one of the greatest discoveries, that man ever made, was the discovery of cookery. Our elementary school books tell us that cookery is done for the sake of developing delightful flavors, or of improving the digestibility of the meat, of foods of whatever kind. Those elements no doubt do play an important part; but Dr. Smith has told the truth when he has implied that thorough cookery would enable us to eat, and does to-day enable us to eat, a great deal of food which contains parasites. The rare occurrence of trichinosis in this country is chiefly due to the fact that we cook our hog products; and there is no kind of question that under the ruling which compelled Dr. Burr to reject those large quantities of meat a great deal of good food for mankind has been wasted.

Now, the time is coming when we cannot afford to waste that food, and it may be coming very soon. With the increase in the number of mouths in this country and in other countries; with the diminution in available acreage; with the shameful neglect of our sea-fisheries, and so on,—going on today in this State for example, so that we are wasting food in that direction,—the pusillanimous giving up of New England agriculture, because, so some say, "we can buy things cheaper than we can raise them," all these conditions within a few years, in my judgment,—and I have given a good deal of consideration to this question,—are likely to bring us, if there happens to come a combination of bad seasons in different countries, right up to the edge of famine; so that it is important for us, sanitarians and health officers, to get these big, broad ideas which Dr. Smith has given us, in order that we may take the right attitude towards this fundamental problem of human food supply.

It is all very well to say we want meat only from a healthy animal. Who is there in this room who can say that he himself is perfectly "healthy," and if he were to be killed for food today would pass Dr. Burr's inspection? Very likely not one of us. I am reminded of the difficulty which the medical students used to have in the old days when they studied with preceptors and went up to be examined. One story is that having thoroughly crammed up for the examination several young men confronted the board of country practitioners, who did not know much about the distribution of the popliteal artery or the ramifications of the brachial plexus, or if they did had forgotten them, but who were good, sensible doctors; and the old doctors gave to the young, would-be doctors, this question: "What is health?" and had no difficulty in flooring every one of them. Now, an equal difficulty meets us in this question, and if we interpret terms too closely, and claim

that health is perfection, then probably very little meat in this State would be deemed fit to eat.

THE PRESIDENT. Before we separate I should like to say one thing. The Board which I represent has only supervisory action over this question of the meat supply, and the real responsibility for years has rested upon Dr. Peters, and Dr. Peters and his department have met it in an absolutely satisfactory and reasonable fashion, until interfered with by recent events. One thing, however, that has become perfectly apparent in the course of the investigations that have been made during the last month under the direction of the State Board of Health has been this striking fact, that the State of Massachusetts has upon its statute books an absolutely complete system of statutory protection. I cannot imagine a better system of protection, and I don't know of any portion of it, except possibly in the city of Boston, that has ever been enforced. It is absolutely waste material upon the statute book. We have got to think upon one thing in the way of improvement, namely, a reasonable inspection of slaughter houses. We have not got it. You gentlemen who make up the local boards of health have all the power of the Commonwealth in that matter, and it is for you to see to it that your slaughter houses are in decent condition. They are not now in decent condition. They are not now fairly inspected, and the meat inspection that is carried on in them is an absolute farce. Men are receiving pay for services they never render, and it is time for the Commonwealth as a whole to see to it that something is done with these small slaughter houses which are an absolute abomination to the communities in which they are situated. I know what I am talking about, because there is one of them in Cambridge. It is an offense that the thing exists, and it is a reproach to the local authorities that it exists. Sooner or later you have got to

come, the community has got to come, to what Dr. Smith suggests, a collection of slaughter houses so small that they can be properly inspected. Each slaughter house ought to have, must have—a proper inspector, and he ought always to be in service, and no work ought to be done in the slaughter house when he is not in service. That is not true today.

DR. FROTHINGHAM. Dr. Smith suggested in his paper that the work of the inspector of meats should be the work of a trained veterinarian. I agree with him. My impression is that very few of the boards of health throughout the State of Massachusetts have a trained veterinarian as a member of their board. It seems to me it would be an exceedingly valuable adjunct to their board, and I would like to suggest to the members here that if they can find a suitable veterinarian in their community he should be made a member of their board of health.

MR. ELLIS. Mr. Chairman, following the discussion and the statements by Dr. Smith, I move that this meeting of the Associated Boards of Health favor the repeal of Section 1 of Chapter 329 of the Acts of 1908, and that if the matter is to be further dealt with it should be done by a commission of experts who shall make recommendations to the next Legislature (adopted).

THE PRESIDENT. Incidental to another question, I have asked that there be distributed certain pamphlets, papers, with regard to the prevention of blindness. The commission that exists for that purpose, a State commission, is doing most excellent service, and it naturally desires to call the attention of all thinking persons and all persons in authority to some means of preventing that most horrible of all calamities, the blindness of the young. I hope that everyone who has one of those pamphlets will earnestly

study it and do what he can in his own community to awaken public sentiment to the enormous importance of the subject represented by it.

DR. SWARTS. In respect to the question of opthalmia neonatorum, which you have just brought up, I would like to state that the State Board of Health of Rhode Island is endeavoring to educate the physicians to the necessity of preventing this disease, and has called to their attention within the last few weeks the greater prevalence of this disease, more particularly in that State, than was thought to exist. In order to accomplish this result the Board of Health is at the present time placing in the hands of every physician in the State an outfit, consisting of a small eye dropper containing a proper quantity of the nitrate of silver solution, of one per cent., properly enclosed within a box, in order that he may have in his obstetrical bag at the time of child-birth a proper solution of the proper strength, and not have to wait for five or six hours to look at his books to see whether or no it is one per cent. nitrate of silver or 40 per cent. formaldehyde that he should use in the child's eyes, or possibly in the country have to ride seven miles to get the solution, or find that his bottle is broken in the bag. What we propose to do is to place one of these in the hands of every physician, that he may have it ready in his obstetrical bag, placing reserve supplies in all the places where diphtheria culture tubes may be obtained. There can be no excuse then for any physician neglecting eyes which are liable to have this disease. It has been brought out that 25 per cent., I believe, of the blindness in many of the blind asylums is due to this ophthalmia neonatorum, a preventable disease, one which can be controlled, and it would seem as if everyone who is interested in the service of the public health, or the public purse, for they become State dependencies after a while, should take an interest in this matter and further this subject.

(Adjourned).

PERSONAL HYGIENE

By PERCY G. STILES, Ph. D.
Instructor in Physiology, Massachusetts Institute of Technology

"The All or None Law."

Most current papers in any department of science must necessarily add to the complexity of our conceptions. It is a gratifying experience now and then to read one which simplifies an important matter. This distinction belongs in a high degree to a recent contribution of Keith Lucas.*

It is a fact so familiar as to be ignored that we grade our muscular contractions to our tasks, neither employing a useless excess of power nor wasting time in insufficient preliminary efforts. If our judgment of the required force is deceived we realize our error in a striking manner, as, for example, when we raise a bottle of mercury which we had supposed to be empty or pick up an empty box which we were prepared to find heavy. The explanation of the graded contractions has never been easy. How can a small muscular movement ever be produced? If a muscle is excited to the point of any response, why does not the internal disturbance prove contagious and cause a maximal discharge of energy? A muscle seems to resemble a magazine rifle in which we find a fresh charge quickly made ready after each explosion. But the analogy breaks down, for the energy set free at each shot from the rifle is inde-

* Journal of Physiology, 1909, XXXVIII, p. 113

pendent of the pull on the trigger. We cannot conceive of burning some powder in a cartridge and saving the rest.

The peculiar muscle composing the walls of the heart closely follows our analogy. If it responds at all to stimulation it makes a full-sized contraction and is for the instant exhausted. The statement of this property is referred to as the "All or None Law." The apparent disparity between the skeletal muscle with its exquisitely graded contractions and the cardiac type with none but maximal responses has now been cleared away. It is impossible to give the details of Dr. Lucas' ingenious experiments. The conclusions to which they lead are of wide application. It is the author's contention that the individual fibres of skeletal muscle cannot give graded responses. For the single fibre the "All or None Law" is entirely valid. The submaximal contractions made by muscles are the expression of the maximal shortening of some fibres and the complete idleness of others. Increasing intensity of stimulation gives greater and greater responses, merely because stronger stimuli rouse to action a larger proportion of the units. As soon as all the fibres are stimulated the maximum of shortening (or of tension) is reached. The difference between skeletal muscle and the contractile tissue of the heart really lies in the fact that in the first any number of the fibres may act without exciting their neighbors, while in the second, any local disturbance runs through the whole structure. Insulation of the striped muscle fibre is its most marked characteristic.

According to this view the fibres are of quite unequal irritability. If we could successfully apply the microscope to a muscle in partial contraction, we should see certain fibres short, thick, and tense, while others alongside would be relaxed and probably thrown into curves by the movement of their fellows. Are we to conclude that when we call upon our muscles to execute contractions of little or of

moderate force we always use the same fibres and that the greater part of the musculature is wholly unused? If so, we have a novel and surprising idea of the motor mechanism of our bodies. The importance of vigorous exercise becomes clear. Moderate exercise may be no exercise at all for the great muscular reserve of fibres hard to stimulate. On the other hand it may be that now one set of fibres and now another is conspicuously irritable. This last supposition is more in harmony with the usual good economy of the tissues.

Whatever else we may deduce from this new picture of muscular action, we shall find reason to emphasize anew the dominant position of the central nervous system. If muscle contractions vary in efficiency with the number of active fibres, it is imperative that the nerve-cells shall be able to call as many fibres as possible into action. When we consider the factors which assist in neuro-muscular training we include the actual increase of muscle substance and, probably, betterment of its quality. But we assume that the chief aim is in the accessibility of the muscle-fibres to influences from the nervous system. In terms of the conception we have been reviewing, the added power is largely secured by opening up channels by which nerve-impulses can be sent to groups of muscular elements long unstimulated. Thus too we may explain the strength of delirium or hypnosis. At the time of these exhibitions the muscles are in poor condition. Suddenly they are found acting with incredible power. We are perhaps witnessing for the first time in the patient's life something approaching a stimulation of all the fibres in the knotted muscles. Physical education is calculated to confer upon the man in health at least a partial command of these unrealized resources.

Another interesting consideration is in regard to the fatigue of familiar experience. We know that our sense of weariness and of incapacity for continued action is hastened

by dislike of what we are doing and postponed by interest and pleasure in it. The endurance displayed by women of slight physique when dancing is a case in point. The wonder of it disappears if we adopt the view that the ordinary voluntary employment of muscles is a fractional one. Seeming exhaustion may indicate fatigue of the nerve and muscle units habitually used. It may not be at all indicative of the state of a much greater number of elements less easily responding to volition. Add to will the auxiliary influence of afferent stimuli acting reflexly, and it is reasonable to suppose that we may cause the participation of many such fibres, distributing the burden more equally through the muscles employed and vastly extending the time of their performance.

VETERINARY HYGIENE

By W. L. BEEBE, D. V. M.
Bacteriologist for the Minnesota State Live Stock Sanitary Board

THE ECONOMIC IMPORTANCE OF TUBERCULOSIS OF FOOD PRODUCING ANIMALS.* The purpose of this paper is to call attention briefly to the serious injury which tuberculosis causes to the live stock industry from the economic standpoint and to suggest means of overcoming it, regardless of its communicability of animals to man. It must be realized that the exclusion of meat and dairy product of tuberculous animals reduces the quantity of available food, thus resulting in a tendency to an increase in the price of these two necessities of life, therefore concerning not alone the producer but the consumer. It is increasing alarmingly, particularly in hogs, as is shown by the federal meat inspection reports. The author states: "The two principal sources of data as to the prevalence of tuberculosis among live stock are (1) meat inspection statistics, and (2) record of the tuberculin test. Meat inspection throws light on the disease in cattle, hogs, sheep and goats, while the information derived from the tuberculin test is practically confined to cattle. The federal meat inspection as extended under the law of June 20, 1906, now covers more than half of all the animals slaughtered for food in the United States, shows that of 52,973,337 there were 788,269 or 1.46 per cent. Probably even a larger percentage are tuberculous in the animals that are slaughtered without inspection."

* A. D. Melvin, Chief of the Bureau of Animal Industry. Read before the International Congress on Tuberculosis, Washington, D.C., 1908. Published in the American Veterinary Review, Vol. XXXV, No. 1, pp. 18-32

For fifteen years the Bureau of Animal Industry has been preparing tuberculin and sending it to State and city authorities for official use besides using it in tests by its own employees. The tabulated results show that out of 400,000 cattle tested, 37,000 or 9.25 reacted to the test.

Out of 24,784 animals slaughtered, lesions were found in 98.39, and if the results from one State where the testing was not carefully done be excluded, accurate in 98.81 per cent.

The author estimates that the annual loss from tuberculosis in animals killed under federal inspection amounts to $2,383,433, and if the same conditions were applied to animals slaughtered without federal inspection the loss would amount to $4,354,855. The stock of animals on hand is also depreciating in value, because of tuberculosis. Assuming that living tuberculous milch cows are annually depreciating to the extent of one-tenth of what the loss would be if they were slaughtered, other cattle one-third and hogs one-half, the total depreciation amounts to 8,046,219. The annual loss from decreases in milk producing is estimated at $1,150,000 and there is also some loss from impairment of breeding qualities, etc. Taking all these items into account, the aggregate animal loss because of tuberculosis among farm animals in the United States is estimated at not less than $14,000,000.

THE RELATION OF BOVINE TO HUMAN TUBERCULOSIS.* The author gives a very careful review of the literature relating to this subject, and quotes many cases where circumstantial evidence points strongly to man being infected from bovine origin. These cases are divided into two groups; those that are of cutaneous and those of alimentary infection. After discussing in a

* W. L. Moss. John Hopkins Hospital Bulletin, Vol XX, No. 215, Feb. 1909

very thorough manner the investigation of cases by the British and German Royal Commissions and those reported by Ravenel, Theobald Smith, Fibiger and Jensen, de Schweinitz, Dorset and Shroeder and others a total is given which shows that of 306 cases investigated, the bovine tubercle bacillus was found in 63 cases, a little over 20 per cent.

The bacillus was obtained in 39 of these cases, either from the mesenteric lymph glands, from intestinal ulcers, or peritoneum, and in the other cases the bacillus was obtained from the cervical lymph glands in 19 cases, from the sputum in one case, and from a case of miliary tuberculosis, from a case of pulmonary tuberculosis, and from a case of tuberculosis of the joint. The fact that the bacillus was found 39 times in the abdominal organs and 19 times in the cervical lymph glands would point strongly to infection through the digestive organs by the use of milk, meat and other dairy products.

Calmette and others have shown quite conclusively that infection through the digestive tract is not of rare occurrence and that the bacilli will pass through the intestine and mesenteric glands into the lungs and there produce lesions where the bacilli rapidly undergo morphological and biological changes, so that they cannot be differenciated from the human type. Until it has been conclusively proven that the bovine bacillus rarely produce death in man it seems advisable to consider it a dangerous foe.

INFECTION AND IMMUNIZATION OF MICE AGAINST RABIES THROUGH THE ALIMENTARY TRACT.* Investigators have indicated the possibility of infecting and immunizing mice through the ingestion of rabies virus. The author found in his investigation that

* R. Repetto.-Compt. Rend Soc. Biol. (Paris) 1908. No. 15, pp. 716-718. Abstracted in Expt. Sta. Record XX, No. 6

the ingestion of rabies virus exercised a more or less pronounced effect in immunizing mice against a subcutaneous inoculation with street virus. All the rats with which the author experimented died of rabies as a result of feeding on rabies virus and 75 per cent. of the mice were also fatally infected by feeding upon virus for a month. After mice and rats had been immunized by ingestion of an attenuated virus they proved to be resistent to subcutaneous inoculation. In a further series of experiments with ten mice it was found that feeding for some time upon normal nerve substance brought about a quite pronounced immunity.

It has been found out by Nocard, Wesbrook and others that the virus of rabies is occasionally contained in milk. In dairy districts where cows are in pasture they are not infrequently bitten by rabid dogs, and it many times happens that the cow's milk is utilized after the animal begins to exhibit symptoms. Then there is a possibility that milk might be infectious before symptoms are demonstrated, the same as the case with saliva. Although it is infrequent that the virus is contained in milk it should be regarded as a source of danger to man.

MUNICIPAL SANITATION

By CHARLES V. CHAPIN, M. D.
Superintendent of Health, Providence, R. I.

SCREENING PRIVIES AGAINST FLIES.—On October 26th, 1908, the board of health of Richmond adopted some very strict rules in regard to the construction and maintenance of privies. Among other matters particular emphasis was placed on the necessity of making these buildings fly proof. It was even provided that all the old privies in the city should be made proof against the entrance of flies. The following are the rules which apply to old privy buildings:—

"The house shall be without openings or cracks through which flies may enter the house. It shall be provided with a tight self-closing door. It shall have an opening or openings for light and ventilation, which opening, or openings, shall be screened for the exclusion of flies.

The door of the house shall not be allowed to remain open at any time, unless there is a self-closing fly door, in addition to the door required under the above rule."

Levy states* that already many hundreds of privies have been reconstructed to fulfill the requirements of these rules.

GOWNS FOR PHYSICIANS VISITING CONTAGIOUS DISEASES.—The Department of Public Health of Philadelphia has recently provided a gown for the use of the physician, to be kept in every house where there is a

* Annual Report of the Health Department of Richmond, 1908, page 46

case of scarlet fever or diphtheria. The cost of the gown is \$1.65, and of the box in which it is contained 40 cents. The following explanatory circular is sent out by the department of health:—

> "To the Head of the House:
> Sir—
> As a convenience to your Physician, and as a means of preventing the spread of disease, we send you with this letter a case containing a cotton gown, which we hope will be worn by the Doctor while in attendance upon the case of contagious disease now in your house.
>
> This gown and the case are the property of the Bureau of Health. They will be called for by a representative of the Bureau after the patient is well, and the sick room has been disinfected.
>
> When not being worn by the Doctor, the gown must be placed in its case and kept there until the next visit of the Physician.
>
> The outfit should be kept at the door of the sick room."

It is provided in the Philadelphia regulations that no person living in a house where there is a case of scarlet fever or diphtheria shall remove from the house until such person's clothes shall have been disinfected by the health department.

DISINFECTION OFTEN UNNECESSARY.—Lemoine* has found that disinfection is not as essential as has been claimed. At the military hospital at Val de Grace, certain rooms were used for isolating single cases of con-

* Rev. d'hyg. 1907, p. 1057

tagious disease. There was often such demand for their use that cases of different diseases quickly succeeded one another, sometimes without any disinfection, and often with slight disinfection. Sixty-five cases of scarlet fever, 41 of measles, 25 of mumps, 31 of diphtheria, 4 of small pox, 1 of chicken pox, and 136 of other diseases are reported as rapidly succeeding one another in these rooms. One case of measles and 4 of scarlet fever developed in the rooms. Often it was necessary to shift entire wards of 20 to 30 beds with only a slight attempt at disinfection. This was done a good many times during nine years without bad results.

The subject of disinfection was under discussion at a recent meeting of the Société médicale des hôpiteaux in Paris.† Comby, Courmont and Lemoine were decidedly of the opinion that disinfection as carried out in Paris by the municipal authorities during the last few years, has had no effect whatever in checking the spread of scarlet fever, diphtheria and measles. They conclude that it is especially useless in measles. It was stated that the official disinfection was a great annoyance, and often expense, to the infected family. Lemoine again spoke of his experience at Val de Grace, and stated his belief that placing so much emphasis on disinfection tended to draw attention away from the mild cases and carriers which are by all odds the chief factors in the extension of the common contagious diseases.

On the other hand, Remlinger‡ believes thoroughly in the importance of fomites as a means for the spread of disease. His arguments, however, are of the a priori type, or are based upon the reports of a few alleged instances of this mode of transmission. He does not seriously attempt to determine the numerical importance of this as compared with other modes of transmission.

† Bull. et. mem. soc. med. des hop. 1909, p. 588.
‡ Hygiene gen. et. appliq. 1908, III, 592-602.

BIOLOGICAL LABORATORY NOTES

By FREDERIC P. GORHAM

Bacteriologist, Providence Health Department, Associate Professor of Biology, Brown University

IDENTIFICATION OF MENINGOCOCCUS, GONOCOCCUS, ETC.—Differences in the fermentative action of the Meningococcus, the Gonococcus, Micrococcus catarrhalis, and other similar forms are reported by Dopter and Koch.*

They employ a medium as follows: To 75 c.c. of slightly alkaline agar is added 1 gm. of levulose, dextrose, or maltose, etc.; after sterilization 25 c.c. of ascitic fluid and 1 c.c. of sterile one per cent. solution of neutral red are added; the mixture has an orange tint and is kept in a water bath at 60 degrees C. for one hour, until a fine precipitate of neutral red appears, then the medium is poured into Petri dishes and cultures of the respective organisms are made.

The Meningococcus after 24 hours on the dextrose and maltose media gives a carmine-red color. On levulose and other sugars no fermentation occurs. The Gonococcus ferments dextrose only. The M. catarrhalis has no action on any of the sugars. The Pseudomeningococcus of Jaeger ferments nearly all sugars.

ANOTHER TEST FOR THE SEPARATION OF THE MEMBERS OF THE TYPHOID GROUP is that suggested by Chatterjee.† The whole surface of an agar

* C. R. Soc. Biol. Paris, 65, 1908, 351

† Centralblatt f. Bakt. Ite Abt., Orig. 48, 1908, 246.

slant is inoculated with B. typhosus and grown at 37 degrees for three or four days. All visible growth is then washed away with sterile salt solution. If the washed surface is reinoculated with B. typhosus no growth occurs, but if inoculated with B. paratyphosus, Shiga's Bacillus, or B. coli growth occurs after 48 to 72 hours at 37 degrees. If the same procedure is followed using B. coli or B. paratyphosus for the first inoculation, corresponding results are obtained with the exception that B. coli inhibits the later growth of not only B. coli but also B. typhosus and other bacilli of the typhoid group. These results are explained by the author as due to the production of a growth-preventing toxin which is insoluble in salt solution but which may be destroyed by heating to 55 degrees C. for one hour. Various combinations of cultures serve to distinguish the different members of the group.

THE ISOLATION OF A SINGLE LIVING BACTERIUM.—The use of increasing numbers of bacteria beginning with one living organism, for purposes of producing immunity, has led to the perfection of the technic of separating out one living organism. It has also given us an idea of the rapidity with which certain forms multiply when in liquid cultures. Webb, Williams, and Barker‡ tell us that when, into six microscopic drops of glycerin veal broth, single bacilli of a somewhat attenuated culture of B. tuberculosis were introduced, after 15 hours' incubation, five out of the six had doubled and the sixth had multiplied into three bacilli.

The technic of separating out the bacilli is as follows: Emulsions are made from a culture and individual bacilli are selected from hanging drops made from the emulsion according to the method of Barber*. The essential parts

‡ Journal of Medical Research, 20, 1909, 1
* The Kansas University Science Bulletin, 4, 1907, 3

of Barber's apparatus are an ordinary glass slide to which are cemented pieces of glass in such a way as to form a box open at one end and on top. This box is lined with wet filter paper and covered with a cover glass bearing a hanging-drop of the emulsion of bacteria. A very delicate capillary pipette is mounted in an adjustable holder on the side of the microscope stage in such a way that it can be inserted through the open side of the box and brought into the hanging-drop while both are under observation through the microscope. A single bacterium may some times be drawn into the pipette at the first trial. When more than one enter they may be placed in another drop of sterile medium and the operation repeated until a single organism is obtained. The presence of but a single organism in the pipette has been tested many times by stained preparations made from the contents.

Barber used this method for studying heredity in certain micro-organisms and has started cultures of yeasts, fungi, amebæ, and infusoria, as well as bacteria, from certain selected individuals of a culture. Already there are records of the isolation of single bacteria of anthrax, tuberculosis, typhoid, colon, influenza, and pus cocci by this method.

ANOTHER TEST FOR INDOL.—Still another addition to our methods for indol determination is that of Tobey.† Tobey concludes that the quickest, simplest and most accurate method for determining the presence of indol is by using the ring method with para-dimethyl-amido-benzaldehyde. This is a modification of Böhme's method which consists of

Solution 1. Para-dimethyl-amido-benzaldehyde, 4 parts.
Alcohol (96 per cent.), 380 parts.
Concentrated hydrochloric acid, 80 parts.

† Journal of Medical Research, 19, 1908, 499

Solution 2. A saturated watery solution of potassium persulphate (as an oxydizing agent).

To about ten c.c. of the broth culture of the organism add five c.c. of solution 1, and then 5 c.c. of solution 2, and shake the mixture. The presence of indol is indicated by the appearance of a red color, which becomes deeper on standing. Five minutes is sufficient in all cases for the completion of the reaction.

Tobey finds that in the ring method of applying the test Böhme's solution 2 is unnecessary. He uses Dunham's peptone solution for a culture medium.

FREQUENCY CURVES.—The question of fluctuating continuous variation and of mutation and of the influence of environment on bacteria is already receiving considerable attention. An excellent discussion of our present knowledge of these subjects and a further contribution to the question of the non-inheritance of variation among bacteria is given by Winslow and Walker.‡ They report a careful study of the variation of two types of the paratyphoid bacillus of Schottmüller, as regards acid formation in dextrose, determined by the method of plotting frequency curves. By a process of selection attempt was made to alter the mean of the curves of the two types but without success. The constancy with which the two types maintained their slight initial differences is an indication of the fixity of these bacterial types in the absence of modifying conditions of environment. Goodman§ has reported similar experiments with the acid production of B. diphtheriæ, but with somewhat different results. Winslow and Walker explain this as perhaps due to the fact that acid production in B. diphtheriæ is relatively variable, while in the paratyphoid group it is relatively stable. All of this work again calls

‡ Journal of Infectious Diseases, 6, 1909, 90
§ Journal of Infectious Diseases, 5, 1908, 421

attention to the great value of the method of working out frequency curves for the various characters of micro-organisms in determining types and species.

THE SERUM DIAGNOSIS OF SYPHILIS.—The rather complicated nature of the Wasserman test has been to a certain extent an obstacle to its introduction into general practice. Caulfield* has recommended the application of the test in capillary pipettes instead of in test tubes. This is a step toward simplification, but the method of Noguchi† to a much greater extent simplifies the process and will probably find favor with laboratory workers as well as with clinicians. It is as follows:—

Reagents Required.

1. *Anti-human hemolytic amboceptor* prepared in rabbits by injecting them five or six times in the peritoneal cavity with increasing doses (up to 20 c.c.) of washed human blood corpuscles, allowing five days interval between each injection. The serum is collected from the immunized animal eight or nine days after the last injection. The titre must be stronger than 0.01 c.c. for complete hemolysis.

2. *Complement.* Fresh guinea-pig serum.

3. *Antigen.* Alcoholic extract of organs or crude preparations of lecithin. To prepare the alcoholic extract of organs one part of mashed tissue (liver, kidney) is extracted with ten parts of absolute alcohol for several days at 37 degrees C., filtered through paper and the filtrate concentrated to about one-third of its volume, and the fluid preserved. To prepare the lecithin solution for antien, 0.3 gram is dissolved in 50 c.c. of absolute alcohol and then shaken with 50 c.c. of physiological salt solution and filtered. The filtrate must be clear.

* Journal of Medical Research, 19, 1908, 507
† Journal of Experimental Medicine, 11, 1909, 392

4. *Suspension of human blood corpuscles.* This is prepared by mixing one drop of the blood of a normal person with 4 c.c. of physiological salt solution.

5. *The serum to be tested.* About ten drops of blood from the patient are collected in a small test tube. The clear serum separated from the clot is employed for the test.

Method of Making the Test.

1. Take six clean test tubes (size 10 cm. by 1 cm.). In the first two of these, place one drop from a capillary pipette (or tube if necessary) of the patient's serum which is to be tested. In each of the second two tubes (which are to serve as controls) put one drop of the serum of a syphilitic case known to give the positive reaction. In each of the third pair of tubes (also controls) put one drop of the serum of a normal person. Now to each of the six tubes add 1 c.c. of the suspension of human blood corpuscles and 0.04 c.c. of fresh guinea-pig serum as complement. Lastly into one of each of the foregoing pairs of tubes put one drop of the antigen solution from a capillary pipette. The second tube of each pair receives no antigen.

2. After being well mixed by shaking, the six tubes are incubated at 37 degrees C. for one hour.

3. At the end of the incubation, add two units of anti-human amboceptor to each tube and mix well by shaking. Incubate the tubes two hours longer at 37 degrees C. Read the reaction from time to time for the next ten to twelve hours during which the tubes are kept at room temperature.

Reading the Reaction.

A negative reaction is indicated by complete hemolysis in both tubes irrespective of the presence of the antigen. On the other hand, a positive reaction is shown by complete absence or partial inhibition of hemolysis in the tube containing the antigen and complete hemolysis in the tube without the antigen.

This method can be carried out in the ordinary biological laboratory where work with sera is going on. Noguchi has still further modified the technic for use in the ordinary clinical laboratory. He has found it possible to dry the reagents on filter paper; in this form they may be prepared on a large scale by the commercial laboratories and placed within the reach of any physician. He gives his method of preparing the various papers required, viz.: anti-human amboceptor slips, compliment slips, antigen slips. In employing the filter paper slips they are dropped by means of forceps into the test tubes already containing the human blood suspension and patient's serum, in the order and at the intervals already stated for the regular test. It is necessary to shake the tubes a few times at intervals in order to insure proper solution of the reagents. The incubation may be carried out perfectly well in the vest pocket if a thermostat is not at hand.

CHEMICAL LABORATORY NOTES

By FRANKLIN C. ROBINSON
Professor of Chemistry, Bowdoin College, Brunswick, Maine

FLOUR BLEACHED BY OXIDE OF NITROGEN. For the last few years quite a controversy has raged with reference to flour beaching. On the one hand mill men have claimed that it was not an adulteration, and on the other food commissioners have claimed that it should be so considered, because it resulted in adding to the flour a definite foreign ingredient which might be harmful to health. As a positive contribution to the subject Mr. E. F. Ladd, food commissioner of North Dakota, has published (Chem. News, March 5, 1909) the results of his experiments on bleached and unbleached flours. These seem to him to establish the following as legitimate conclusions: When oxids of nitrogen are used to bleach wheat flour, both nitrous and nitric acids act upon the flour and form permanent compounds which remain in the flour. These compounds are in the oil of the flour and also in the gluten, and make the food products from such flour distinctly less digestible. Unless these experiments can be shown to be improperly performed, it seems that there is little chance remaining for argument in favor of bleached flour as a pure food product.

A good test for bleached flour is the so-called Griess test used for nitrites in drinking water, namely sulfanilic acid and naphthylamine acetate or hydrochlorid. These can be added directly to the flour in question. But a few flours when not bleached give the red reaction.

But if dry H_2S be drawn through a sample of flour for one hour it is found that bleached flours lose their whiteness, while unbleached are unchanged.

TEST FOR PURITY OF MILK SUGAR. When one gram of the finely powdered sample is dusted over the surface of concentrated sulfuric acid, in a shallow flat dish, kept at 15°c., no color will be observed in an hour if the sugar is pure, but even 1 per cent. of cane sugar present will give a yellow to brown color.

Milk sugar is also almost insolvent in dilute alcohol, while cane sugar is considerably soluble in that liquid.

BLOOD FROM PERSONS POISONED WITH CARBON MONOXID. It is well known that such blood differs in color from normal blood and its color is more stable. This difference is emphasized by diluting 100 times, and adding a few drops of copper sulfate solution, which gives at once a purple red color, while pure blood turns green. If a few drops of fresh tannin solution are added to such blood, it gives a red precipitate which remains unchanged in color, while pure blood under the same conditions gives a dirty red precipitate which changes to brown. The tests should be made without exposure to air more than necessary.

PURE AND ARTIFICIAL CIDER. The difference between pure and artificial apple juice may not be a question of great moment to public hygiene, but yet a simple test which shows the difference has such general interest that it seems worth the space it will take. It is taken from an article in the April number of the Analyst.

The raw liquid or a portion concentrated by evaporation is mixed with an equal volume of ethyl acetate and shaken at intervals for five minutes. After standing till separ-

ation takes place, remove the ethyl acetate layer and pour some of it carefully on the surface of lime water in a beaker. A yellow ring of color forms at the junction of the two liquids in all cases where pure apple juice is tested.

Artificial cider gives no color at all.

DISINFECTION OF BOOKS. The exposure of books to the fumes of formaldehyde in boxes or closets has proved to be an efficient method of disinfecting them, but it has the disadvantages of giving them an odor which is disagreeable, and which clings to them for a long time. With a few books this is negligible, but when for example a whole library or large collection of school books must be disinfected, and ready for use again within a short time, some other means should be used.

A most excellent one is to subject them to the vapors given off from boiling alcohol and water in equal parts. In order to prevent condensation which would wet the books, the disinfecting chamber and the books should be heated to about 60 degrees C before the vapor is let in, and if possible reduced pressure should be produced by partial exhaustion of the air with a pump. When this is done complete disinfection is brought about in half an hour and the books come out dry and fresh.

A NEW DISINFECTANT. Dissolve five parts naphthalene in 25 parts ether, add two parts crystalized carbolic acid and, when dissolved, add 100 parts spirits of turpentine. The odor is not objectionable, and the efficiency is high. Shaken up with water, 1-100, it forms an emulsion which is very effective as a germ distroyer. E. S. Gribinonk of Russia is its originator.

DUST LAYING OILS. Very many of these are on the market, and many of them are very efficient. The best of

them are non-drying mineral oils, not too volatile to soon evaporate nor too viscous to be greasy and sticky. An oil with specific gravity about .841 and a viscosity of from 30-40 at 20°c. is about the best. Some flavoring oil, as that of cedar or nitrobenzol may be added. Some contain a little carbolic acid for disinfecting purposes, but there is no advantage in this, for all such mineral oils are disinfectants of themselves.

There is no need for paying fancy prices for such oils on the plea that they are of special make, and the result of expensive experimentation. Any mineral oil dealer can supply them of the above constitution.

PUBLIC HEALTH LEGISLATION, NEWS AND NOTES

By F. H. SLACK, M. D.
Director, Boston Board of Health Laboratory

NORTH CAROLINA. The General Assembly of 1909 was very favorably disposed towards efforts to promote the public health. The appropriation of the State Board of Health was increased and the salary of the secretary fixed at $3,000 instead of $1,000 per year.

Under the new law the secretary must reside at Raleigh and devote his entire time to public health interests.

Dr. Richard H. Lewis, secretary of the board since 1892, worked hard for this new legislation and the fact that he sought no personal interest is shown by his resignation which takes effect June 30th. Dr. Watson S. Rankin succeeds him as secretary and executive officer.

While increased appropriations open up a new era in public health work in North Carolina, which will without question be carried on in a thoroughly competent manner, it is with regret that we see Dr. Lewis leave the position where he has labored so faithfully and effectively. The high esteem in which he is held by the public health workers of four countries was shown in 1907, by his election to the office of President of the American Public Health Association. It is hoped that his resignation from the secretaryship of the North Carolina State Board does not imply the abandonment of public health work by one whose long experience and ability make his services of great value.

WISCONSIN A REGISTRATION STATE.* The 1907 Legislature passed a bill requiring immediate registration, in all parts of the State, of deaths before interment and the direct return of certificates to the State Board of Health, thus placing the registration of deaths upon a fully effective basis, acceptable to the Census Bureau.

The admission of Wisconsin to the registration area of the United States, makes this area for the first time exceed one half of the total population of the country.

MONTANA. The Fourth Biennial Report of the State Board of Health of Montana, 1907-'08 contains the report of Dr. H. T. Ricketts of the University of Chicago, relative to his investigations into the cause and prevention of Spotted Fever in the Bitter Root Valley, carried on during the years, 1906-'08. For this work Dr. Ricketts was at the last meeting of the American Medical Association awarded the grand prize for original research.

Spotted Fever or Rocky Mountain Fever is formed in the northern and middle Rocky Mountain states and often proves fatal, both to man and animals.

The details of the investigation whereby the incidence of the disease is traced to the wood tick, the study of the life cycle of the wood tick, and the experiments proving the hereditary transmission of the disease in the tick are most interesting and instructive.

Since the disease is highly fatal in man, much attention was given to developing a serum treatment, but the number of cases on which this has been used seem yet too small for a satisfactory interpretation of the results.

Various hosts of the tick have been studied and methods are outlined by which the ticks may be eradicated.

The investigation has not as yet been concluded, but

* Wisconsin State Board of Health Bulletin, Oct.-Dec., 1908

there seems no reason in the light of what has already been done why with a proper appropriation from the state and intelligent co-operation of those in the regions affected the disease should not be eradicated.

VERMONT. The 1908 Legislature passed the following act regulating the sanitation of slaughter-houses:†

It is Hereby Enacted by the General Assembly of the State of Vermont.

Section 1. The State Board of Health is hereby empowered to make and enforce such regulations as it deems best for the purpose of controlling the sanitation of slaughter houses and other places where meat and meat products are prepared and kept either for sale or storage.

Section 2. All acts and parts of acts inconsistent with this act are hereby repealed.

Section 3. This act shall take effect from its passage. Approved Jan. 22, 1909.

AN ACT TO PROVIDE FOR THE PURCHASE AND DISTRIBUTION OF ANTI-TOXIN. It is hereby enacted by the General Assembly of the State of Vermont.

Section 1. The State Board of Health is hereby authorized to purchase antitoxin for the treatment of diphtheria and to distribute the same free of charge upon application therefor by physicians in regular standing under such rules and regulations as said board may prescribe and the expense thereof shall be paid by an order drawn by the auditor of accounts upon vouchers duly approved by said board.

A person selling or disposing of any antitoxin purchased or distributed under the provisions of this act for personal gain shall be fined not more than fifty dollars or not less than ten dollars. Justices of the Peace and municipal

† Vermont Medical Monthly, April 15, 1908

courts shall have concurrent jurisdiction of offences under this act.

Section 2. This act shall take effect from its passage. Signed Dec. 3, 1908.

AN ACT TO PROHIBIT THE DISCHARGE OF SEWERAGE or other Polluted Matter into the Waters of Ponds or Lakes. It is hereby enacted by the General Assembly of the State of Vermont.

Section 1. No person shall discharge sewerage or other polluted matter into the waters of any pond or lake having an area of 1000 acres or more, lying wholly within the state. A person who violates a provision of this act shall be fined not more than two hundred dollars nor less than twenty dollars. Justices shall have concurrent jurisdiction with the county court of offenses under this act.

Section 2. This act shall take effect Oct. 1, 1910.

Approved Jan. 27, 1909.

KANSAS.‡ Tuberculosis Campaign. The 1909 Legislature provides $10,000 a year for two years to the State Board of Health for the purpose of inaugurating a state wide educational campaign for the suppression and prevention of tuberculosis and for carrying out the provisions of a "compulsory notification" law.

Other public health legislation was passed including an anti-spitting law. The State Board of Health was also charged with the sanitary supervision of barber shops and public bath houses.

A law has been passed in Kansas making it a misdemeanor to purchase, trade or exchange a diseased animal for the purpose of disposing of the same for food, seller and purchaser being both liable.

‡ Bulletin of the State Board of Health, March, 1909

RICHMOND, VA.* The Richmond Health Department has secured a verdict in its favor in a test case in virtue of which more than 400 wells of the city which are said to be a constant menace to public health will be condemned and filled.

CHICAGO, ILLINOIS. The city health department has issued a regulation requiring that all milk sold in the city unless from satisfactorily tuberculin-tested cows, must be pasteurized.

RHODE ISLAND. The State Board of Health has sent to each practising physician of the state a small outfit containing 1 per cent. silver nitrate solution in a sterile vial, with a sterile dropper compactly arranged in a wooden case, to be used in treatment of the eyes of the new-born as a preventive of opthalmia. Duplicate outfits may be obtained by the physician at the State Culture Stations.

* Journal A. M. A., March 6, 1908

BOOK REVIEWS

Sanitation of Public Buildings. By W. P. GERHARD. John Wiley & Sons, New York, 1909.

One of the most pressing needs of the day is the popularization of scientific knowledge; and in particular, clear and readable expositions of sanitary practice are everywhere in the greatest demand. Books of this character are, of course, always open to the dangers which surround "a little knowledge." In subjects which, like sanitary practice, are so largely matters of detail, it is very easy to delude the reader into feeling that he has mastered a subject, of which he really knows very little. What the architect or the hospital superintendent or the director or the ordinary citizens needs is a statement of the problem which will indicate its importance and the general lines of its solution so that he will neither neglect the whole matter nor think that he is competent to deal with it himself.

Mr. Gerhard has succeeded to an unusual degree in producing books of this kind. As many as fifteen of them are listed opposite the title page of the present work, and these volumes, on various subjects connected with sanitary engineering of buildings and their protection from fire, represent a very solid and valuable kind of public service.

The Sanitation of Public Buildings includes what are practically five separate essays on Hospital Sanitation, Theatre Sanitation, Church Sanitation, School Sanitation and the Sanitation of Markets and Abattoirs. Several of these are reprinted and the tone and content of each is somewhat different. It is perhaps unfortunate that the chapter on hospital sanitation comes first, as this seems to the reviewer the only one which is not altogether satisfac-

tory. In this particular instance Mr. Gerhard has somewhat obscured his general principles by going into considerable detail in regard to water supply and sewerage,—detail which is too elementary for the sanitary engineer and which could only mislead the architect or layman who tried to follow it. Furthermore the important subject of ventilation, is curiously enough omitted from this chapter.

The other four chapters are written on a much broader and more suggestive plane. The chapters on the sanitation of theatres and churches are particularly admirable. The first is an enlargement of the paper read by the author before the meeting of the American Public Health Association at Ottawa in 1893 and contains that much quoted statement, "I know of at least one theatre in greater New York where each time the curtain rises a strong whiff of sewer air greets the audience." The evidence which Mr. Gerhard presents in regard to the abominable conditions of drainage and water supply which exist in most theatres and in too many churches will come as a revelation to many; and these papers ought to serve as powerful tracts in the missionary campaign for better sanitary conditions.

The chapter on school sanitation forms the most careful and elaborate section of the book and embodies a thorough study of German regulations in regard to school houses. This chapter includes discussions of the general location and site of the school, play-grounds, fire escapes, arrangement of corridors and stair cases, shape and dimensions of class rooms, lighting, ventilation, seats, wardrobes, methods of heating, and sanitary arrangements, and forms probably the best short treatise on school sanitation in English. There is also appended to this chapter an excellent bibliography. One section of particular value emphasizes the importance, just beginning to be recognized in all sanitary matters, of operation, as compared with original construction. It is as useless to build a good school building

and put it in charge of an ignorant janitor (a political appointee) as it is to treat a good water filter or sewage filter in the same way. This is undoubtedly one of the most discouraging features of the whole problem. When one remembers the recent efforts of the Board of Education in the city of New York to force the janitors of its school buildings to burn their ashes mixed with a magic powder, one realizes the difficulty of securing efficiency in this respect.

The chapter on markets and abattoirs is notable for its interesting historical summary of the subject and for its argument in favor of municipal markets. A public market building is one of the few things of real value which the human race owes to that misguided genius, Napoleon I.

One or two minor errors slip into every book. In particular the statement on page 54 in regard to sewage disinfection must be considered incomplete without mention of the most important of all sewage disinfectants, chloride of lime, which is far more efficient than permanganate of potash which Mr. Gerhard suggests and much more economical than disinfection by steam. On page 86 Mr. Gerhard points out the importance of serving pure water in theatres but the danger from originally polluted water is quite infinitesimal in comparison with the danger that follows the passing of a common drinking cup from hand to hand. In the interests of public health the passing of water in theatres should be entirely prohibited unless individual cups of paper can be provided.

On the whole the book can be highly praised as one of the most useful of Mr. Gerhard's many contributions to the subject. It is of the greatest value to young architects and ought to be in the hands of all those persons who are responsible for the erection and maintenance of the class of buildings with which it deals.

C.-E. A. WINSLOW

Practical Dietetics with Reference to Diet in Disease. By A. F. Pattee. *Fifth Edition.* Published by the author. Mount Vernon, New York. Price, $1.00.

This appears to be a very practical manual. It draws its material from the best source and is a well-proportioned digest. It is not free from misstatements but these are of an academic character and do not impair the usefulness of the recipes and suggestions.

P. G. STILES.

Pure Milk and the Public Health.

A Manual of Milk and Dairy Inspection by A. R. Ward, B. S. A., D. V. M., Assistant Professor of Bacteriology and Director of the State Hygienic Laboratory, University of California, with two chapters by M. E. Jaffa, M. S., Professor of Nutrition and Director of the State Food and Drug Laboratory, University of California. Taylor & Carpenter, Publishers, Ithaca, N. Y.

No more important problem confronts the health officer of the present day than the proper oversight and control of the production and handling of milk, and interest in the practical sanitary inspection of dairies and in the safeguarding of milk supplies by bacterial analysis has been widespread during the past few years.

The problem is a many-sided one requiring exact knowledge of, and most careful attention to, widely differing details and the literature has been confined chiefly to reports of different investigations and systems of inspection, widely scattered in the form of papers in scientific journals, reports of committees appointed by various organizations, Board of Health reports, etc., etc.

Dr. Ward treats the subject in a comprehensive manner, taking up in detail the following subjects: The Contamination of Milk; Changes in Milk Caused by Bacteria; Epidemic Diseases Transmitted by Milk; Bovine Tuberculosis

and Other Cattle Diseases; Municipal Sanitary Control of Milk; Pasteurization of Milk; Microscopic Tests of Milk; Bacteriological Examination of Milk; Certified Milk; Chemical Analysis of Milk; Adulteration of Milk.

These various aspects of the milk problem are presented in an able manner; every detail of the production, care and inspection of milk receiving careful attention; the author has drawn freely from the work done by various investigators, and the list of references is particularly complete and valuable.

It is assumed that the reader possesses a general knowledge of bacteriology, and the book is written especially as an aid to the health officer, the veterinarian and the progressive agriculturist.

Dr. Ward's wide experience renders him especially capable to edit a work of this character and he has accomplished the task in a most efficient manner. Such a work widely circulated will be of great value in improving general dairy conditions and in establishing uniformity of technique in the various laboratory tests. Its low price, $2.00 net, postpaid, places it within the reach of everyone.

FRANCIS H. SLACK.

AMERICAN JOURNAL OF PUBLIC HYGIENE

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EDITORIALS

TELLING THE TRUTH TO THE HEALTH OFFICER.

Medical men will never come round to telling the truth about matters of public hygiene, or anything else which seems to conflict with the wishes of the patient, until they come to take a radically different view of their duties to the patient. At the present time it seems to me that the majority of men are governed by the respectable old individualistic idea that their whole duty in the practice of medicine is to the patient, and that his interests are always to be paramount. Those who fixed in our code of ethics this eighteenth-century individualism thought they were doing a very noble thing in making it clear that the doctor was not to serve his own interests, but rather those of the patient, when any conflict arose. It did not occur to them that there was a third party in the transaction,— namely, the general public and its interests.

But with a living interest in public and preventive medicine, which now at last I think has begun to increase by leaps and bounds, there comes upon the medical profession a dawning sense that they are the servants not of their patients primarily, but of the community first, last and all the time, and of their patients only in so far as their interests are identical with those of the community. It is for the patient's interest to keep it dark whenever we find an inconvenient case of infectious disease, but obviously enough it is for the public interest that we shall do nothing of the kind. Gradually physicians are beginning to be educated and to educate their patients up to the point of reporting the cases which are likely to leak out anyway, cases such as diphtheria, scarlet fever and small pox. When the matter can be decently hushed up, as in tuberculosis, it is still the practice of a great many physicians to be blind to their public duties and to serve private masters, namely their patients. Still more strongly is this the case when we come to those most dangerous and contagious of all common diseases, gonorrhea and syphilis; but with the listing of gonorrheal ophthalmia as reportable, the thin end of a huge wedge has been inserted, and I have hopes for the future in this direction.

I have no hope that any good will come to us from moral lectures or from editorials like the present. I look to great, unconscious forces, such as the public interest in hygiene and in preventive medicine, communicating themselves all unbeknown to doctors, and thus gradually changing their instinctively feudal habit of private spirit into one of public spirit. I cannot help thinking that it will come before long to seem ignoble and mean-spirited to serve a private master rather than to serve the public health, to be a henchman and a lackey,—as we are when we truckle to our patients' wishes in the face of what we know to be the public good.

But there are other great unconscious forces from which I hope for help in this fight. Medicine is certainly becom-

ing more scientific, and every step ahead in the progress of scientific medicine drives the lying habit nearer and nearer to distruction. When a man is in the habit of being hazy about his diagnoses and his treatments, the truth has no power in his mind, because it has no clearness. It is a whisper, not a shout. When, on the other hand, he has made his measurements and his examinations so deft and sharp that his diagnosis and treatment have clear outlines in his own mind, it will be much harder for him to make over the truth to suit his patient's or his pocket's interest. The scientific habit of mind, the scientific habit of taking our bearings direct from fact, and depending with a child's confidence upon our Mother Nature—is psychologically incompatible with the habit of fixing up the truth to suit somebody's wishes. The two cannot easily co-exist in the same mind.

It is the chief business then of those of us who care for truth in medicine not to preach and write upon the subject, but to work as hard as we can for public medicine and for scientific effort in all the fields of our profession. If we can make those two notes prevail, if we can make them dominant, truth-speaking will come of itself. A man could not, I think, realize the importance of public health, as health officers realize it from their close acquaintance with its powers for life and death, and yet go on plotting against the public weal as men do when they falsify statistics and conceal the truth in diagnosis. No doctor thinks it right to lie to shield a murderer, even if he is his patient, but the typhoid carrier, the gonorrhœic and the syphilitic, the diphtheria carrier, the tuberculosis carrier may be all of them murderers many times over, if only we can make them see it. To protect and shield them is treason to society. To bring home that truth to doctors, to patients and to the public is, I think, our chief duty and privilege.

RICHARD C. CABOT, M. D.

THE RELATION OF THE HEALTH OFFICER TO THE MEDICAL PROFESSION.

There can be no doubt that the successful enforcement of public health Regulations depends very largely upon the attitude of the medical profession toward such Regulations. If this attitude is one of cheerful and hearty compliance, the success of these Regulations is assured; if, however, the profession shows a grudging compliance or positive hostility, our Regulations must be more or less a failure.

For our present purposes we will consider only the protection of the public against contagious diseases. Here the rôle of the medical man is of the greatest importance, for he is the one who first sees disease.

Public Health Laws and Regulations generally impose certain duties on physicians, in these diseases, and hold them to a rather strict account for their performance.

Physicians are required to *report* such diseases to the local board of health, usually the health officer, also usually a fellow practitioner, and thereafter such cases become objects of care from both the attending physician and the health officer.

Furthermore the law (in Vermont, at least) requires that physicians report not only the cases which they *know* to be "contagious and dangerous to the public health," but also such as they *suspect* are such.

There are also the contact cases, those who have been exposed; there is the question of the length of quarantine and its stringency, and finally the details of cleaning up and disinfection, in all of which the health officer and the medical attendant have perhaps an equal interest.

In dealing with these contagious diseases, questions must

continually arise, in which the duty of the physician to his patient and that of the health officer to the public apparently conflict.

In the detail of diagnosis, there is often opportunity for very warm debate. The list of diseases which we construe as "contagious and dangerous to the public health" is yearly lengthening, and our facilities (Laboratory and otherwise) for accuracy in this detail are still limited; other features of the management of epidemic disease may furnish subjects for controversy between the health officer and medical man; and concessions are inevitable in arriving at a line of action. Who shall concede?

Our Public Health Laws and Regulations usually make the health officer the secretary and executive officer of the local board of health. The guardianship of the public health is directly in his hands. He has certain duties imposed by law, among the most important of which are those relating to the protection of the public against contagious diseases. He must know where these diseases are, whence they came, who are exposed, that his quarantine is respected, that the cases are kept isolated long enough, and that the infected premises are cleaned up after the case ends.

He comes into frequent and intimate contact with the medical profession in all these matters. The success or failure of preventive measures depends on the mutual action of both parties.

Each may annoy and hamper the other in what he conceives to be his duty.

Much depends upon the personality of the two men; upon their skill, their honesty and broadminded regard for the highest interests of the greatest number of people.

Medical men, like other human beings, are of various kinds; mostly honest, mostly skillful and mostly public spirited, yet sometimes otherwise. To an exceptional degree, medical men are sensitive in professional matters,

jealous of their ethical rights, tender of their patients' feelings.

Health officers are likewise human; though the ideal officer should combine qualities something more. These officers should be honest, intelligent, devoted to the public interests, fearless and tactful.

The combination of these rare qualifications in one man, it must be recognized, is extremely unusual.

A frank recognition of these facts should make all who are zealously striving for the protection of the public health seek to elevate this office; seek to make the selection of this officer a matter of first importance. And here it may be remarked that the local health officer should be a State Board appointment; thus ensuring the appointment for fitness, and removing it as far as possible from local influences.

In order that the health officer's relations to the medical men in his jurisdiction may inure to the highest public good, that officer should have the respect of the profession. He should have its respect always, its friendship as far as possible.

A very unpleasant duty devolves upon health officials at times to prosecute medical men, ofttimes brother practitioners. It is a duty, however, that may not be shirked when the occasion requires it for the protection of the public. That physicians are not prosecuted often enough to secure their full respect for public health regulations is probably true. It is a truism that lax enforcement of any law begets disrespect of that law.

To prosecute a doctor in court, and do this without leaving in its train bitterness and hostility, requires of the official peculiar qualifications. Personality must be buried; disinterested zeal for the highest public good must prominently appear.

Preventive medicine is daily taking more advanced grounds in all our laws and regulations. The medical pro-

fession is as steadily being held to more stringent public duties. On those whose duty it is to enforce our health laws a greater and more delicate task is being constantly imposed. It is imperative that the standards by which our health officers are selected should be made more exacting.

The dignity and pecuniary emoluments of these officers should be placed on higher planes—should be made more nearly commensurate with the peculiar and exacting duties which are expected of them. If we have noticed a luke-warmness among medical men toward our health laws, if there has occasionally been frank opposition to such laws and friction between the official and the doctor, it is proper that we inquire if the official has not been at least partially at fault.

Such complaints when sifted usually reveal only an over-zealous, perhaps officious, health officer, or one lacking in good judgment and tact. Hence the prominence which a level head and tact, bordering at times on conciliatoriness, assume in the qualifications of the health officer.

To be sure our health laws do not, any more than others, take cognizance of individual peculiarities or pre-conceived opinions. Medical men have such peculiarities and opinions. They should waive these in the presence of public duty. This is an aspect of the situation that physicians are too apt to overlook. In their argument with the health officer, they forgot who may be the real sufferers. So when health officers and physicians cannot honestly agree, the concessions should be made in the interests of the public. The physician should bow to official judgment and action, reserving to himself the right to *think* as he pleases.

If official action under such circumstances is founded on intelligent investigation and evident impartiality, the relations between the health officer and physician need not be seriously strained.

The health officer, if he be a physician and one of two or three practicing in a small town, may easily make himself obnoxious to his brethren. It is conceivable that such an officer might visit contagious cases or suspected cases in the absence of the attending physician, or even remark on the diagnosis or treatment to outsiders. Such unprofessional conduct need not be seriously considered in this connection, except to remark that it is rare, and becoming, I believe, rarer daily.

The successful solution of any difficulty which there may be in the relation of health officers to medical men, I believe, will be found as I have indicated, in raising the standard of the former office. While the fault has probably not been wholly one-sided, the remedy should come largely from the side of the official.

And, finally, as in so many measures intended to benefit the public, we must look to the public for aid. Public opinion must warrant us in filling the health office with the best men available, by supporting such men morally and financially.

CHARLES S. CAVERLY,

President Vermont State Board of Health.

INDUCTIVE PUBLIC HYGIENE.

The conception of the study of public hygiene as the study not of fancies or fads but of determinable facts, from which tentative generalizations may be made, checked, revised, polished, reviewed, and finally established as principles for application in new instances, seems to be a product of the last few years. It is the application of such principles to new instances, the derivation from the new instances (always different in some manifestations from previous ones) of new side lights confirming or modifying the principles so far grasped that constitute at once the fascinations and the difficulties of public hygiene.

Such a conception of public hygiene differs wholly from the older, although still recent, conception which considered specific hygienic evils as mere examples of certain general laws, formulated by great hygienists of the past. This conception held that ill-health and especially the infections are due to and spread by certain vague factors, "peculiar weather," "ærial convection," "sewer gas," "excavation of the soil," even "general unsanitary conditions." To this conception was due the failure to examine closely the individual instance; to compare, contrast, speculate about and experiment with series of instances; to question the "established principles," or even to try critically whether or not "established principles" really applied in the specific instance at hand. The modern conception makes the study of a specific instance in public health practice as necessary as the detailed clinical study of a specific case in therapeutic practice. The health officer who would "diagnose" and "treat" an outbreak of an infectious disease without de-

tailed investigation is as irresponsible as the physician who would diagnose and treat a serious case on a telephone report. To tell a community in the throes of typhoid or diphtheria to "clean up" is worse than to dismiss a case of frank lobar pneumonia with nothing but advice "to take good care of himself."

A specific diagnosis leads to a specific treatment, adapted specifically to the case in hand. The (very young) medical student often thinks that therapeutic medicine merely means learning a list of diseases and then remembering which drug "goes with" each disease. So the health officer sometimes supposes that diphtheria means "close the schools," that malaria means "oil the water," that typhoid means "boil the water." Yet diphtheria is often better controlled by keeping the schools open; there is no object in oiling water, in which, for local reasons, mosquitoes will not breed; and typhoid may appear in a community with an unimpeachable water supply, with a water supply subject to temporary pollution, or with a water supply continuously and badly polluted—and the water *may have nothing to do with the typhoid at all, in any one of the three instances.*

To attribute every outbreak of typhoid to the water supply is no less silly than to attribute every abdominal pain to appendicitis. To require filtration wherever typhoid exists would be as inexcusable as to use tuberculin for every cold. If every muscular pain meant rheumatism and and all rheumatism yielded to salicylates, if every red rash meant scarlet fever and all scarlet fever yielded to sassafras tea, how sweet and pleasant would the path of the physician become! It is only the little knowledge, proverbially dangerous, which establishes such childish beliefs. As investigation into the problems of public hygiene goes on, there develops, as always in every other line of human investigation, more intricacies to solve, more evidence of the need for exacting technical and expert study of every individual

condition, first for correct diagnosis and then for logical, efficient and successful treatment.

These statements with the change of a few words here and there are but the statements made over and over again in the past for every science, and notably for therapeutic medicine, in the world-old struggle between accepted traditional teaching and new inductive experimental work. To illustrate their practical application to concrete problems, it is only necessary to look keenly at the existing status in almost any division of public health work.

At all times new beliefs, based on new and more exact data, have encountered opposition, not alone from those who, mentally lazy or mentally inert, prefer not to brace themselves to the shock of a new impression,—nor alone from those who feel that to accept a new teaching is an admission that their previous work and efforts have been in a wrong direction, but also from those who, only indirectly interested in the principles involved, have built upon the old teaching some important proceeding. Seldom is it that those personally interested in an "established" dictum welcome a discovery or a new teaching which "upsets the apple cart." This is but human nature. The plumber who was a revered oracle and savior of mankind when he alone (in current belief) could combat the insidious inroads of the fearful dragon "sewer gas," the disinfector who succeeded to the plumber's seat of frowning authority as the only one who could stay the transmission of dread infections, the engineer who upon the creed that typhoid fever comes from water, has built up a position of authority, half-accepted even by the public hygienists, so great that eyes are turning to him as the great sanitary force of the future—all these cannot cordially welcome the teachings that would rob them of their pre-eminent positions. Yet all such incidental agencies, depending on a single usefulness for their importance, must take their due and proper place in the scheme of things, and not attempt full control. The

plumber may still plumb, even though the future existence of the race no longer hinges on his efforts. Terminal disinfection has its place, although it is no longer regarded the chief weapon of the sanitarian. Typhoid comes from water sometimes—and sometimes water must be filtered. The engineer has scope and duties enough in improving the general conditions of life, without magnifying the one item of occasional reduction in typhoid fever into a clarion call for the supreme control of the life and health of the nation.

Ultimately to medicine, the science and art dealing intimately with the anatomy and physiology of the individual, on which all the relationships, personal, sociological and economic are necessarily based; but directly to public hygiene, the systematized outgrowth from medicine of the application of all forces to the preservation of society from physical disabilities, the protection of the public health on all sides naturally belongs. The sociologist may greatly aid here, the engineer there, the chemist in a third place, but to medicine alone, and because medicine alone comprehends in its grasp all sides of the question, belongs the application of the various available forces to the great end.

But to believe that therefore every medical man is *per se* and *ex-officio* competent to deal with public health problems would be great nonsense—as great as to believe that every "railroad man" is competent for any branch of railroading. Each railroad man differentiates into a definite field, becoming expert in that one—knowing, it is true, something about the others, but seldom knowing enough to be an authority outside of his own field. Neither a good switchman nor a first-class passenger agent is necessarily an expert train dispatcher. Unfortunately is has too often happened that the medical health officer has had to deal with problems involving for their proper solution technical aid, but has not realized the needs, or realizing them, was forced by circumstances to act himself. In the smaller communities practising physicians, without special hygienic

training or study, frequently find themselves forced to handle epidemics, problems of sewage disposal, of school architecture, etc., and have often and very naturally made messes of them—as much so as the obstetrician suddenly called to extract a cataract or a nose and throat specialist to diagnose and treat carcinoma of the breast. This is no reflection on medicine, on medical teaching or on medical men, but simply an illustration of the specialization of modern science.

A railroad engineer is not necessarily competent to construct a filter plant, nor is a county surveyor necessarily a good waterworks superintendent—as certain communities have found to their cost. That engineering as a science contains in some of its subdivisions, understood and practised, according to their capacities and bents, by some engineers, the solution of several hygienic problems, is no guarantee that the first engineer encountered will prove to be an authority on every phase of sanitary engineering—much less on sanitation in general. That medicine as a science contains in some of its subdivisions, understood and practised, according to their capacities and bents by some physicians, the solution of several hygienic problems, is no guarantee that the first physician encountered will prove to be an authority on every phase of sanitary medicine—much less on sanitation in general. But at best, the engineer cannot as a rule deal directly with more than the transmission of one disease, typhoid—and then chiefly with the water-borne variety; while the physician at worst is more or less familiar with all the infections. The change from the individualistic viewpoint of the physician to the sociological viewpoint of the public hygienist involves no such complete dislocation as would the change necessary to an engineer in turning from the consideration of stones and mortar to the control of the bodies and the lives of his fellow man.

Yet this is all somewhat beside the point. That public hygiene is a study yet incomplete excuses those attempting,

even though they needs must fail, to master its entirety. But no one man will ever grasp it all. If we see this and, leaving prejudice, pursue the truth, each in his proper field, there will arise, in time, a science; and he who best applies it must then be leader. To medicine, it seems, belongs the larger field. Then all the more should medicine explore it, and yet with humble mind acknowledge each aid and good example from without.

H. W. HILL.

SPECIAL ARTICLE

THE PRINCIPLES OF SMOKELESS COMBUSTION.

By EDWIN S. HALLETT
St. Louis, Mo.

For many years there has been an agitation of the smoke question in the large cities, and without inquiry or study of the combustion problems, the cities near the anthracite beds considered the problem solved by requiring coal users to burn hard coal or coke. The high price of this class of fuel soon became prohibitive for commercial purposes, especially for such industries as come in competition with the cheap bituminous coals. A quantity of bituminous coal of Illinois can be delivered to any city in the state which will have a heating value equal to a ton of anthracite for less than three dollars. It appears, then, that smoke is levying a duty of more than a hundred per cent. upon the industries and that such as are in competitive trade can not pay it.

It is an astounding fact that the damage done to health, to manufactured fabrics, in store and in use, to buildings, to foliage and flowers and to the personal comfort of the millions, should continue unabated with a remedy at hand and that without expense to the coal user or the municipality. In fact from purely a fuel standpoint there is a profit in the better combustion that is necessary to prevent smoke. This slow progress of the smoke prevention appears to be due to a popular impression that smoke is necessary to prosperity. You frequently hear the jocular reply that what we want is more smoke these hard times. A smoking chimney should mark the firm as not informed, at least upon one branch of his own business. The most needed asset in the engineering profession today is a proclamation, heralded far and

wide, shouted in the ear of every coal user in the land, that coal of the poorest quality can be burned without an objectionable amount of smoke, and with greater economy aside from the price of the coal, and without the necessity of installing expensive apparatus to do it.

To say that coal high in volatile matter cannot be burned economically without smoke is as absurd and as wide of the truth as to say that the medical profession had made no advancement in the cure of diphtheria. It is not a lack of engineering information but a failure in the popular dissemination of it.

It is the purpose of this brief review to set forth a few fundamental facts, divested of technical terms, which if acted upon would rid us of the greater part of the smoke nuisance. All coal contains essentially these parts in varying proportions, namely: carbon, or as we say fixed carbon; volatile hydro-carbon, the portion which is driven off as a gas when heated but before combustion; sulphur in various compounds; ash, the non-combustible mineral matter; and moisture. The difference between anthracite coal and bituminous coal is the relative proportions of fixed carbon and volatile matter. With hard coal the large proportion of fixed carbon produces so much heat that the small distillation of volatile matter is burned as it is driven off. Bituminous coals vary in amount of volatile matter from say 20% to 50%. That is, coal is mined with all amounts of volatile matter but we name those having less than about 18% or 20% as anthracite and all above that as bituminous. The distillation of this gaseous portion begins at a low temperature and is quite perceptible at five or six hundred degrees Fahr. and increases rapidly up to the point of complete combustion, which is between 1300 and 2000 degrees. With a very light fire nearly all the volatile matter may be distilled out and pass up the stack and be lost. Not all the gas passing off is visible as smoke but the smoke is a reliable indicator of the extent of the loss. It follows then

that the first step in smokeless combustion is to pass this distillate through a chamber that is hot enough for combustion and which is supplied with a sufficient quantity of air, which also should be warm. The very remarkable condition that exists at present in the average steam plant is that in which the gases are distilled on the surface of the fire and pass up, striking the cold boiler surface, which chills them beyond any possibility of ever being burned. This chilled carbon gas is non-combustible even in a high temperature. For this reason we never use the expression "burning smoke," for once the smoke is formed as indicated above it is past all chance of ever being anything but smoke or soot. The common fire-tube boiler with the straight grate, hand-fired, is about the worst construction that could be thought of for burning soft coal. The temperature of the water in a boiler under 100 pounds of steam pressure is 337 degrees. The shell of the boiler cannot be made much warmer than that with this steam pressure. This is about a thousand degrees too low for combustion to take place. What happens, then, when coal is shovelled into a furnace of this kind? The hydro-carbon gas as it is distilled strikes the relatively cold boiler shell and forms a flake of soot, which is as incombustible as graphite which it resembles. If the combustion does not take place before this chilling it never can afterward. Just here is the secret of the whole business. The fatal blunder is in attempting to heat a boiler with distilled but unburned gases. So long as the process of combustion is taking place the gases should not be permitted to come in contact with the boiler plate or tube surface. They should be carried under fire-brick arches and if possible thrust against a brick wall, and supplied at this point with additional fresh air so admitted as to be well mixed with the igniting gases. Now with this statement of facts it will not be difficult for any one to construct a furnace that will meet these conditions. There is no patent on this. There are obviously many

plans which are inexpensive and require no skilled labor but a good bricklayer. New settings will permit a more perfect job, but any furnace can be perfectly equipped without disturbing the boiler or shutting down longer than is required to clean out.

In classifying the various means of effecting perfect coal combustion the following would be good: (1) Special brick arches for hand-fired furnaces. (2) The down-draft, a patent hand-fired furnace. (3) The mechanical stokers. (4) The steam jet devices, also patented. The fundamental in all perfect furnaces is the fire-brick arch. The best setting for the common shell firetube boiler is that with a brick arch extending the full length of the boiler, the crown of the arch just beneath the belly of the boiler. Apparently this would decrease the capacity of the boiler, but experience indicates the contrary. The arch may stop just back of the grates, and a wall supported on an arch run across the furnace cavity and extending up around the girth of the boiler and down to the bridge-wall, but say 18 inches back of it, in such a manner as to act as a baffle, which becomes incandescent with heat and at the point of deflection of the flame mixes and burns all the gases. At the bridge-wall a supply of air should be admitted through small apertures to make the combustion perfect. (See fig. 1.) The arch is often built forward from the boiler and is called the Dutch Oven. The obstructing fire-brick work for mixing and heating the gases at the rear of grates may take many different forms but the cross section must not be reduced so far as to impair the draft. It must be remembered that no brickwork will long withstand the great heat.

The down-draft furnace is one of the most perfectly smokeless forms yet devised. It consists of two sets of grates, the lower of the ordinary cast iron bar, the upper is made of 2″ or 2½″ tubes entered into small drums front and back, the whole having a circulation of water from the boiler. The tube grates rise backward to give circulation to

the water to prevent burning out. The heating surface of the grate is said to add 25% to the capacity of the boiler. In operating, the coal is all fired upon the water tube grates, and a portion of the coal falls upon the common grates, and the flames from the two fires meet in the chamber where the heat becomes very intense. The distilled hydro-carbons gases of the fresh coal must pass through the lower hot fire as well as through this combustion chamber before they reach any cooling surface. This furnace will burn any kind of bituminous coal, but lump coal must be used in starting fires if it be of the non-caking variety. The first cost of the furnace is large and the cost of maintaining the water grates is necessarily high. However the economy in having perfect combustion would cover that objection.

The mechanical stokers have their special field of usefulness. They came as a means of burning the otherwise useless fine coal which was carted to the dump from the mines. Many of the stokers are built on correct lines and when properly handled give good efficiency. The coal is automatically fed into the furnace from the front edge or from the front and sides, or in some instances pushed in from the bottom and spread out in such a manner that the distillation takes place at the outer margin, and thus must pass over the high temperature of the rear furnace. This layer of coal may be made thick or thin as the draft will permit. The stoker is decidely the furnace of the large unit. The coal is handled by conveyors into bunkers overhead and is fed by gravity to the stokers with no hand labor.

The last group of smoke consumers which I will mention is the steam jet device. This is an attachment for hand-fired furnaces by which a steam jet is turned in over the fire with a blast of air at the time a fresh charge of coal is applied. The principle upon which it works is that the gases burn at a lower temperature when mixed with an excess of air with steam. The effect of the blast of steam and air is to deflect the flame from the boiler sheet. After the first

distillation is over, in about a minute, the steam and air are automatically cut off. Such a device is very satisfactory as an emergency, but it costs something for steam and lowers the furnace temperature rather than raising it.

From the engineer's standpoint the smoke problem has been solved in a way that meets every demand. The objector has had the last prop knocked from under him. There is not a valid argument to resist the compulsory ordinances of the cities that want to be clean. There is not even an occasion for delay in enforcing ordinances, as the cost of temporary equipment is so small, not to mention the returns due to high furnace efficiency. The most needed step is a widespread knowledge of the facts set forth in the foregoing statement.

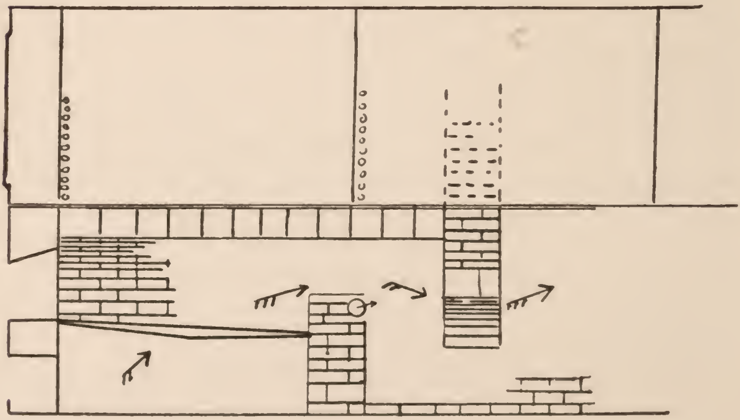

FIG. 1

AMERICAN PUBLIC HEALTH ASSOCIATION

POLLUTION OF THE GREAT LAKES.*

By Dr. JOHN A. AMYOT
Toronto

The Great Lake water system consists of Lakes Superior, Michigan, Huron, Erie and Ontario, with their connecting rivers or straits.

They include an area of 98,640 square miles.

The approximate dimensions of them are as follows:

Lake Superior	350 miles	x 150	miles
Lake Michigan	300 "	x 80	"
Lake Huron	300 "	x 120	"
Lake Erie	225 "	x 70	"
Lake Ontario	200 "	x 50	"

The depth of these lakes has the following averages:

Lake Superior	900 feet
Lake Michigan	800 "
Lake Huron	900 "
Lake Erie	120 "
Lake Ontario	500 "

Their elevations above the sea are as follows:

Lake Superior	600 feet
Lake Michigan	576 "
Lake Huron	574 "
Lake Erie	565 "
Lake Ontario	247 "

The supply of water is inexhaustible for all the population that could be crowded around these inland seas. Over four million people now use this source.

The following table will show the approximate chemical

*Read before the American Public Health Association at Winnipeg, August, 1908.

composition of these waters taken at several points during this last summer:

POLLUTION OF THE GREAT LAKES

IN PARTS PER MILLION

Point from which Collected	Free Amm.	Alb. Ammonia	Nitrates	Nitrites	Ox. Cons.	Chlorine	Hardness			Turbidity	Color
							Total	Perm.	Temp.		
Port Arthur	0	.055	.325	trace	2.88	1	84.5	66.5	18.0	30	0
Soo.Ste Marie	0	.029			1.77	1	46.1	46.1	0	1.5	0
Kincardine	. 01	. 06	. 16	trace		3	116	92	24	2	0
Goderich	0	.045	. 09	.0005	1.00	3	111	100	11	45	0
Sarnia	.010	.045	.092	.0028	1.15	3	120	93	27	3	0
Courtright	0	.045	.0935	.0015	.74	4	116	94	22	3	0
Windsor	0	. 07	. 18			8	126	102	24	45	0
Bridgeburg	.008	.050			1.61	8	128	112	16	1.5	0
Toronto	.012	.048	.153	0045	1.45	8	148	98	50	4	0
Brockville	.013	.057	.087	trace	1.05	8	147.0	95	52	2.5	0

The nitrogen content is low in all of them, averaging about .1425 all told, at Courtright, a fairly representative point.

In oxygen consuming material rarely more than 1.25 per million is found.

The total organic content, therefore, of these waters is extremely low, and is generally constant within 10%.

The chlorine content, beginning at Lake Superior with 1 per million, reaches 3 in Lake Huron, at Godwich, and at Port Huron, 4 at the lower end of the St. Clair river at Courtright, where, as at Bridgeburgh, opposite Buffalo, at the entrance into the Niagara river, it reaches 8 per million. In Lake Ontario this holds pretty constantly, and in the St. Lawrence river, at Brockville, it is still unaugmented. It remains 8 per million. Salt reaches abound on both lower shores of Lake Huron and along the River St. Clair, Lake St. Clair, and the Detroit river. There is now around this point and in the immediate vicinity, or on the shores of Lake Erie, the largest population collected along the Great Lakes, and most of these people use salt from the

Huron-St. Clair region. The great bulk, on account of the great depth and the amount of dilution water entering, probably keeps the Lake Ontario chlorine unincreased over Lake Erie. The *hardness* of the waters of the Great Lakes is largely carbonate of lime in origin. It begins at Lake Superior with about 50 parts per million and ends in the St. Lawrence river with 148 or 150 parts per million. This is just enough to make it pleasant drinking, to not encrust boilers too severely, and to allow us to use lead pipe without danger in our plumbing. This hardness at any given point is generally quite constant. The *turbidity* is generally not more than 2 per million, and after great storms rarely goes above 40 per million. Exception must be made in the case of Lake Erie, the shallowest and the most storm-disturbed of all the Great Lakes. In this lake it is the exception to find its water showing below 20-25 parts per million of turbidity. Some of the river cities would not think this an undesirable water.

This lack of turbidity has its disadvantage for the hygienist, for when he tries to convince the people that the water is sometimes dangerous they look at him with incredulity, holding a glass of this clear water up before him. A cubic centimeter of—a vigorous culture of—typhoid bacilli in a pailful of water wouldn't make it look less clear to an ordinary observer than it was before. In the open of these lakes (miles out) the bacterial count rarely exceeds 10 per cubic centimeter, and does not contain colon bacilli, though the sewage of over four million people is discharged practically untreated into it. The final dilution is great, the sedimentation is great, and down where nature gets plenty of time to finally decompose it all.

If we could get our water intakes out 10 or 12 miles from the shore, in most cases we would get this almost bacteria free and almost certainly sewage free water. But the shore bottoms of all these lakes, except Lake Erie, drop

almost precipitously so that at the distance of a mile from shore the water is quite frequently 200 feet in depth. In the neighborhood of our cities it has frequently been observed that with favoring winds, streams of uncharged sewage, like the Gulf stream, wend their way out from shore as much as three or four miles. The winds are very inconstant in direction in these lakes, so that these streams may easily be blown up or down shore. Winds up or down the lake lasting any length of time cause piling up of the water. When this finds its level currents of inconstant direction start up or down the lake.

The normal temperature of these waters in the summer months is rarely above 40° F., except on the surface. The surface water may go up in temperature to 60° F., especially in the Lower Lakes. This surface water blown in on the shore recedes by an undercurrent, often reaching a depth of even 50 feet, as far as a mile from shore. In this way, if the surface water is found infected the deep water going into an intake may become infected. Again, over an intake that millions of gallons of water are entering, surface water converges, even though the mouth of the pipe is as deep down as it can be placed in practicable practise. In the case of streams entering the lakes they do not run out into the lake in a constant direction. The chlorine estimation will show that sometimes it is up, sometimes down the lake, corresponding to the direction of the winds or governed by the currents in the lake produced by those combined winds spoken of above.

No population emptying its sewage into one of these lakes can with safety take its water supply from it even miles away from the outfall without paying for it in deaths from typhoid and other intestinal diseases. The farther out from shore and the deeper the mouth of the intake is from the sewage entrance the less frequent are the chances of infection, but they will come. We sometimes hear engi-

neers say the prevailing winds are in a certain direction, therefore the intake should be placed in the opposite direction, and all will be well. But we should guard against the occasional, as well as the prevailing. If we kept the sewage out of these waters they would be ideal, but this is nearly an impossibility. Sewage disposal methods are notoriously uncertain.

They will not remove all pathogenic organisms, often not even organic matters (the best of them), at all times and under all conditions. Some of them are expected to remove organic matter and pathogenic bacteria. Some of them remove organic matter and only a small percentage of the bacteria. The sterilizing methods are designed to remove the bacteria. All of them are more or less crude and usually badly managed; the result is lack of uniformity in action and occasional infections with the resultant dangers. They are all of them much better than nothing, and many of them reach nearly the ideal, but we can't safely place our trust in a plant that almost of necessity takes a holiday, sometimes drinks too much and from overfeeding gets indigestion. The occasional failures are serious to the users of the water.

Some cities on the Great Lakes have diverted their sewage to their neighbors, a decidedly unkind procedure (Chicago, for instance), but when all this is done the shipping still remains, and into the harbors of some of these cities this is considerable.

Their sewage almost invariably passes into the water without treatment. Zurich treated its sewage, had a clear, beautiful water to draw its supply from, but its typhoid rate was 75 per 100,000. The shipping did it. Hamburg got its cholera epidemic from the shipping. Some of the cities and small towns on the Great Lakes have had typhoid passed to them in this way.

The following striking examples of the experience of

some of the Great Lake cities are opportune at this point:

When Chicago drew its water supply from intakes a mile from shore its typhoid rate for the last three years of this condition was 82 per 100,000. Placing their intakes four miles out, leaving the sewer outlets where they were, reduced the rate to 40 per 100,000. Diverting three-quarters of their sewage later on, leaving the four-mile intakes unaltered, reduced the rate to 22 per 100,000. The sewage of one-quarter of a million people still reaches the lake.

In Cleveland, with an intake not far from the exit of the harbor (the greater part of Cleveland's sewage was discharged into this), there was a rate of 165 per 100,000 for the last two years of the condition. A new intake four miles out and in another direction, the typhoid rate for the next two years fell to 22 per 100,000.

In Toronto, with a faulty conduit under a sewage-polluted bay, for five years the typhoid rate was 55 per 100,000. A replacing steel pipe reduced the rate during the next five years to 20 per 100,000.

The bacteriological analysis of the waters of several of these cities shows a considerable percentage of the samples to contain colon bacilli, and in many of these cases we can't console ourselves by the statement that these may have come from animals other than man, for there is very little drainage from pasture lands in the neighborhood of these cities going into these supplies, such as happens with supplies like that of New York and Boston. They are in a preponderating proportion from the human intestine.

Very few of these cities show typhoid rates below 20 per 100,000, notwithstanding the fact that they are all well sewered, use very little well water, have very fair milk supplies, and are not swarmed with flies.

Yet no cities in temperate zones with unquestioned water supplies show such high typhoid rates. Vienna and Munich, with mountain-top supplies; Frankfort and Dres-

den, with artesian supplies in unquestioned soils; Zurich, Hamburg, Rotterdam and London, with properly-filtered water, show rates rarely exceeding 7 or 8 per 100,000. They all had high rates before. Now, physically and chemically, these Great Lakes supply waters that cannot be surpassed in the world. From the hygienic standpoint they all show that they are dangerous from our own very neglect and lack of appreciation of what we are asking them to do. We throw our sewage into them and expect them to give us pure water. We won't give them time to purify it, nor have we so far given them any help.

The remedy obviously is to reduce that pollution by the introduction of appropriate methods of sewage disposal, and last but most important of all, filtration by the slow sand filtration method that will guard us all the days of the year and all the minutes of the days in about as certain a manner as the ingenuity of man has yet been able to devise.

Toronto, in June of this year, voted $3,700,000 for the disposal of its sewage and the filtration of its Lake Ontario water supply, and is hoping for a great big reduction in its typhoid and intestinal disease morbidity and mortality.

DISCUSSION.

MR. GILBERT H. PRATT, of Providence, R. I.—If I remember rightly, Dr. Amyot made the statement that the water of the Great Lakes is not adapted to treatment by mechanical filtration. I would ask whether any actual experimental work has been done in this regard, and also, whether there has been any study of the rates under slow sand filtration?

DR. AMYOT—From a hygienic standpoint, there is no doubt that lake water can be filtered by that method.

MR. HARRY E. JORDAN, of Indianapolis, Ind.—In the city of Indianapolis, during the course of the last year, over six thousand analyses of water of the city gave a bacterial content of 26 per c. c.; colon reaction positive, 3.2 per cent. of the samples; at the same time, the regular monthly analyses of various bottled waters gave a bacterial content of 125, with 7 1-2 per cent. of positive colon reactions.

In the city of Independence, Mo., a somewhat similar condition occurred. The people were not satisfied with the condition of the public water supply, which was drawn from the Missouri river and purified by passing through a series of settling basins. They were in the habit of buying spring waters whose source was the fissured limestone over which the town was built. This was originally quite pure, but the settlement of the city of Independence has polluted the limestone strata, and examinations of this supply during this year showed a bacterial content of 1,500 to 3,000 per c. c., with the colon bacillus practically constant, while the city supply showed a bacterial content of only one-third to one-half as much with the colon bacillus present 20 per cent. of the time. These waters are often sold in bottles that are improperly cared for, no attempt being made to sterilize them before refilling. Their handling by typhoid patients and their nurses is a source of danger of the same sort as occurs in the infection of milk bottles.

DR. JAMES D. LAFFERTY, of Calgary, Alberta—According to the Public Health Act, our Provincial Board has absolute power and control over domestic water supply in the Province. No municipality, corporation or person can begin or take the first steps towards a public water supply for domestic use or make any change in the same if in use, until they have submitted to the Provincial

Board, plans and specifications, and an analysis of the water, and receive the approval of the board.

The Government has appointed a sanitary engineer as a member of the board, on whom devolves the responsibility of approving plans, and examining water and systems which are submitted to us. Further than that we have absolute supervision of all streams and waters to provide against pollution of these waters; moreover, our decision is absolute. There is no appeal from the decision of the Provincial Board of Health in Alberta in matters of this kind, and I think it is well that it should be so.

STATE CONTROL OF PUBLIC WATER SUPPLIES*

By CHARLES O. PROBST, M.D.
Columbus, Ohio

A few years ago the writer was visiting a friend some twenty-five miles from home, and in driving about the country stopped for dinner at a little hotel kept by a widow. The picture of a fine young man of about twenty-four attracted my attention. I asked the proprietress who it was. With tears stealing down her cheeks, she informed me that it was the picture of her only son who had died a few weeks before from typhoid fever contracted in Columbus.

There is a small pleasure resort on an island in Lake Erie in the State of Ohio, where many thousands of visitors go for a day, or a few hours between boats, during the summer. The sewage from many hotels and eating houses pours into a land-locked bay, where are also the boat landings. Water is pumped from this bay and is served at many places for drinking purposes.

How many cases of sickness never traced to this source are caused by these conditions, none can tell. The villagers have been indifferent and unwilling to bear the expense of introducing sewerage and pure water.

Should the correction of such conditions, which I presume exist in most of the States and Provinces, be left entirely to the local authorities? Most emphatically not, in my opinion.

If a polluted public water supply concerned only the

*Read before the American Public Health Association at Winnipeg, August, 1908.

community that uses it, there might be some argument in favor of home rule, though in this case it would more properly be home mis-rule.

But this is not a local question. In these days of rapid transit and involved business and social relations, conditions differ greatly from what they were in the walled cities of former generations. The State has become in large measure one community, and it must assume increasing responsibility for the conditions which threaten the lives and health of the people.

If the State has the *power* to prevent a municipality from furnishing impure water we cannot escape the conclusion that it should use this power when that becomes necessary.

When, and to what extent, should the State assume control of public water supplies?

In the first place, it should be the duty of the State to protect from pollution, as far as possible, all sources of water supplies of which use is being made.

Municipalities might be given power to protect themselves, but this is a grant of power that municipalities are very slow to make use of. For instance, in Ohio, municipalities have authority under the law to prevent and punish pollution of a public water supply within a distance of twenty miles, but no use has been made of this power.

And why twenty miles? How far may dangerous pollution of streams extend? The old English Commission said there was no stream in England long enough to recover itself. True, the streams in England are not very long.

Was St. Louis hurt by Chicago? Many think so, and the United States Government was appealed to for protection.

Suppose Chicago should admit it, but say to St. Louis: "Remove the little pollution we contribute to your water supply by proper methods of purification."

The question coming up in all populous States is: Can

the streams and watersheds that must furnish public water supplies be kept free from contamination by laws and inspection?

This may be possible for some of the States, but not for the great Middle-West territory, where usually municipal and industrial wastes must go to the streams.

Should these wastes be purified in all cases where the stream is used in any part of its course as a public water supply, or should water purification be depended upon for protection?

We cannot settle this problem for all communities in general terms. Each community affords a problem of its own. We may have to cleanse the sewage of the town above and purify the water of the one below in order to protect the latter. In other cases it is possible that either procedure would accomplish this.

In that case who shall decide whether the town above shall purify its sewage, or the users of the water below be made to filter it.

The State, as I see it, can best settle such questions. It may do this by giving adequate authority to some commission to control all sources of public water supply, and to prohibit the use of its waters for the disposal of municipal or industrial wastes without the permission of such commission. Instead of creating a special commission for such work, it is much better, in my judgment, to give this authority to the State or Provincial Board of Health.

I can best express my views of what should be the relation of the State to municipal water supplies by giving the salient features of recent legislation in Ohio, and this is my excuse for referring to home affairs.

The Act under which the State Board of Health has operated since 1893, in the approval of plans for water or sewage works, was materially strengthened by adding a penalty of from one to five hundred dollars for its violation.

In addition, no garbage or manufacturing plant having a liquid waste which may enter any stream within twenty miles above the intake of any public water supply, may be established, until the location of such plant, including plans for disposal of the wastes, have been approved by the State Board of Health.

A new Act gives the State Board of Health much larger powers for the protection of the waters of the State, and of existing public water supplies. The Act provides that when official complaint is made to the board that any municipal or other corporation, or person, is discharging sewage or other waste into any stream or body of water, and is thereby creating a nuisance detrimental to health or comfort, or is polluting any public water supply, the board, after investigation, and after a public hearing, may require the introduction or enlargement, if existing, of sewage purification works, or such other installations or changes as it may deem necessary to remove the cause of complaint. The board's order to that effect must be carried out within a time to be fixed by the board.

It is further provided that when official complaint is made to the board that the public water supply of any city or village is polluted and dangerous to health, the board shall investigate the charges. If substantiated, and if it is found that the sources of pollution cannot well be removed, the board, after a hearing, may order the corporation or person owning or operating the water works, to change the source of supply, or to introduce purification works, or to change or enlarge existing purification works, if that will give adequate protection.

In both cases the order of the board and the time within which it shall be executed must be approved by the Governor and the Attorney-General.

It will be noted that in both cases the initiative must be taken by some local authority. In the case of pollution of

a stream or lake the complaint must be made by the council or board of health of some city or village, or the commissioners of any county, or trustees of any township. In the case of pollution of a public water supply the complaint is to be made by the board of health or health officer of any city or village, or 10 per cent. of the electors thereof.

Supplementary to these two sections is another giving the board control of all water and sewage purification plants.

The board has recently made a special and extended investigation of all such plants in the State. It was found that many of these, through faults of construction or operation, or both, were giving poor results. An inefficient municipal filter is for the public, what the usual household filter is for the family—highly dangerous if the water supply is polluted.

To meet this condition the new Act provides that whenever the board finds that any water or sewage purification works, on account of incompetent supervision or operation, is inefficient, the board, with the approval of the Governor and Attorney-General, may order the owners, or those in charge of such plant, to make such changes in operation within five days as will secure an effluent satisfactory to the board. If they fail in doing this, then the board may require them, within ten days, to appoint, with the approval of the board, a competent person, and pay his salary, who shall take charge of the plant and operate it until results satisfactory to the board are obtained.

It has been found in our State that the limit of permissible bonded indebtedness of municipalities has been the most serious obstacle in securing water and sewage purification plants. Especially is this true as regards sewage disposal plants, as such plants are not usually for the direct benefit of those who have to pay for them. A large number of our cities and villages have about reached their bond

limit in payment of other municipal improvements, and when asked to introduce needed water or sewage purification works, have been able to reply that it was legally impossible under the bond limit.

To meet this it is provided that municipalities, for carrying out the provisions of the Act, may exceed their bond limit already provided by 5 per cent. of the total value of all property listed for taxation.

It is made the duty of all municipal officers who have to do with the raising of tax levies, to provide, within the limit named, for such sums as may be necessary to carry out the orders of the State Board of Health for the purposes mentioned.

The arbitration clause of the Act should be referred to. When the bill, which did not include this clause, was introduced, it raised a storm of opposition from municipal officers, which seemed likely to defeat it. This was almost wholly removed by providing for arbitration.

If the orders of the State Board of Health, after approval by the Governor and Attorney-General, are not satisfactory, they are to be submitted to two experienced sanitary engineers, one chosen by the board and one by the corporation or person affected. If they do not agree, they choose a third. They may affirm, modify or reject any order, and their findings must be accepted by the board and be enforced in the same manner as an original order.

The expense of arbitration is divided equally between the State and those requesting such reference.

A penalty of $500 is provided for the failure or refusal of any person to perform any duty required of him by the Act. This would include the mayor, members of council, city solicitor, and all boards or officials in charge of or responsible for either water or sewage works.

The Act may be enforced by the Attorney-General bringing suit at the State Capital, thus avoiding a local

jury. The Governor and Attorney-General may, however, remit all or a part of the penalty upon good and sufficient cause being shown.

It remains to be seen what results will follow the proper enforcement of this Act. One further step should be taken to give the State full control. No municipality, corporation or person should be permitted to place anything of an injurious character into any stream or body of water that is being made use of for a public water supply, without the approval of the State Board of Health, and that board should have a sufficient number of inspectors to keep all sources of supply under close supervision.

WATER PROBLEMS OF ILLINOIS AND NEIGHBORING STATES.[1]

By EDWARD BARTOW

Since the term "Middle West" is rather vague the writer has decided to consider only his own State and neighboring States, namely: Michigan, Indiana, Kentucky, Missouri, Iowa, Wisconsin and Minnesota. Probably the most extensive work on water problems of these States has been done by Frank Leverett*, who has made a study of the well waters of the Illinois glacial lobe and of flowing wells and water supplies from other sources in Michigan.

Dr. A. C. Lane† had previously discussed the mineral waters of Michigan. W. S. Blatchley‡, State Geologist of Indiana, has made a report of the mineral waters of Indiana. W. G. Kirchoffer§ treats of the sources of water supplies in Wisconsin. L. S. Smith|| has discussed the water powers of northern Wisconsin. W. H. Norton[a] with Samuel Calvin and A. G. Leonard, has made a report on the artesian wells of Iowa. Edward M. Shepherd[b] has made a study of the

[1]Read before the American Public Health Association at Winnipeg, August, 1908.

*Monograph No. 38, United States Geological Survey, 1899.

*Flowing Wells and Municipal Water Supplies of Michigan, 1906 and 7.

†Water Supply and Irrigation Paper No. 31 of the United States Geological Survey, 1899.

‡Twenty-sixth and Twenty-seventh Annual Reports of the Department of Geology, Indiana, 1901-2.

§Bulletin of the University of Wisconsin, No. 106, 1905.

||United States Geological Survey, Water Supply and Irrigation Paper No. 156, 1906.

aIowa Geological Survey, Vol. VI, 1907.

bUnderground Waters of Missouri, United States Geological Survey, Water Supply and Irrigation Paper No. 195, 1907.

underground waters of Missouri. Reports by A. W. Palmer[c] and Edward Bartow[d] have described conditions existing in Illinois. R. B. Dole[e] and F. F. Wesbrook report on surface waters in Minnesota. Reports of a general nature have been made by H. K. Barrows and A. H. Horton[f] on the surface water supply of Great Lake and St. Lawrence river drainages; and D. W. Mead[g] on The Hydrology of the Upper Mississippi Valley, and the Geology of Wisconsin Water Supplies.

It seems inadvisable in this paper to deal with other than water problems of interest to the sanitarian or to those interested in furnishing water to municipalities.

Of the States mentioned, Michigan, Indiana, Illinois, Wisconsin and Minnesota have a common interest in water from the Great Lakes. Michigan only has no interest in the Mississippi river and its tributaries. Artesian water is found in all of the States. In Minnesota, Wisconsin, and Michigan are found numerous small lakes from which water supplies may be taken. All of the States have a common interest in the shallow well, which furnishes a supply of water to a large proportion of the inhabitants dwelling in the smaller municipalities and on the farms. Illinois, situated in the centre of this group of States, has all the conditions mentioned, except the possibility of obtaining a water supply from small lakes. Therefore, a consideration of the water problems of Illinois, relating to Lake Michigan, to the Mississippi and its tributaries, and to the deep and shallow well waters, may be considered as, to a certain extent, a considera-

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[c]Chemical Survey of the Water Supplies of Illinois, Preliminary Report, 1897.

[c]Report for years 1897-1902.

[d]Report for year ending August 31, 1906, and Municipal Water Supplies of Illinois, 1908.

[e]Water Supply and Irrigation Paper, United States Geological Survey, No. 193.

[f]Water Supply and Irrigation Paper, United States Geological Survey, No. 206.

[g]Jour. Assn. Engr. Socs., Vol. XIII, No. 7, July, 1894.

[g]Jour. American Water Works Association, 1893.

tion of many representative sources of water supply in these States.

The municipal supplies are obtained from the Great Lakes, rivers, and from wells. The surface waters from the Great Lakes and rivers furnish the greater part of the water, though not the greater number of supplies. In Illinois, 60 of the 227 cities having general water supplies obtain such a supply from rivers, lakes or ponds, yet only two cities which contained more than 10,000 inhabitants in 1900, rely entirely on well waters for their water supply. Similar conditions exist in Minnesota. While only 25 per cent. of the supplies are from surface sources, the larger cities use such water.* In Wisconsin also, only 25 per cent. of the towns from which reports were obtained† use surface water, yet only four of the larger cities use well water exclusively, and several have changed recently. In Michigan‡ only five cities with more than 10,000 inhabitants obtain their water supplies from wells.

This is easily explained, because settlements are usually located on some stream or body of water, and because the growth is dependent on the abundance of the water supply. If a city located on the lake obtains a water supply at a distance from the shore, from a point where the current is flowing by the city, it was supposed that pure water would be obtained. The supposition is shown to be false by the experience of Chicago, where extending the intakes farther and farther into the lake failed to give a pure water; and in Michigan, where the worst typhoid epidemics in the State have occurred in cities obtaining water from the Great Lakes. When it is apparently necessary for a city to take its water supply from the lake and empty the sewage nearby, the water supply necessarily becomes pol-

*Water Supply and Irrigation Paper No. 193, p. 150, U. S. G. S.
†Bulletin University of Wisconsin, No. 106, p. 242.
‡Water Supply and Irrigation Paper No. 18, p. 24, U. S. G. S.

luted. Chicago is so conveniently located that the construction of the drainage canal has carried away the sewage and has given the city a purer water, and has decreased the typhoid rate to less than 20 per 100,000 in the years 1904-6. Yet Chicago, with no sewage entering the lake within the city limits, is at the present time troubled by the prospects of sewage from neighboring cities. The typhoid rate in northern Indiana lake towns is much higher than in Chicago, and investigation of the water furnished to the cities of Illinois north of Chicago shows that untreated water is unsafe for use. A filtration plant at Kenilworth gives a very satisfactory water. This plant should serve as an example for cities, not only of Illinois, but of the other States along the lake, which can undoubtedly obtain a satisfactory supply of water from the lake when proper precautions are taken. The appointment recently of the Lake Michigan Pure Water Commission, of which Dr. W. A. Evans, the Commissioner of Health of Chicago, is president, to study conditions in Lake Michigan, is a step in the right direction.

Owing to the density of the population in the State, none of the rivers or streams can be used for drinking purposes without treatment. The same is true to a great extent in the other States. In parts of Minnesota, Wisconsin and Michigan the population is not so great, but the water is often highly colored. The methods of treatment available are sedimentation and filtration, in combination of the two, and with or without the use of a coagulant. Sedimentation alone is difficult owing to the character of the suspended matter. A trial at St. Louis showed it to be unsatisfactory, and at the present time a coagulant is added with good results.* In Illinois one slow sand filter is in operation at Rock Island, but owing to the large amount of sediment carried by the water of the Mississippi river, it is not successful. Slow sand filters are not to be recommended for the southern

*Trans. Am. Soc. Civil Engineers, LX, 170 (1908).

part of this region. They have been recommended for Minneapolis, Minnesota, and Grand Rapids, Michigan. In neither case is the turbidity as high as in the streams in the more southerly part of the region. The majority of the plants use mechanical gravity filters with sulphate of aluminium or lime, and sulphate of iron or lime and sulphate of aluminium as coagulants. By this system very satisfactory results can be obtained. The difficulty with these plants is that the running is often too mechanical, and not enough attention is paid to the varying conditions in the rivers or to a control of the effluent. The control of water supplies from the lake or rivers requires precautions to prevent pollution, and especial care in the chemical, and especially the bacteriological control of the water as it enters the mains either from the lake or from the filter plants. Every plant should have a chemical and bacteriological control of its water supply. Plants which use 1,000,000 gallons or more a day could, we believe, profitably support a laboratory. Here determinations can easily be made of the color, turbidity, and alkalinity on which the amount of coagulant to be used is based; and simple bacteriological tests will show the character of the effluent. Some of the companies which own several plants have their own experts who go from plant to plant examining the water of each at stated intervals. Several independent plants could join in the employment of such an expert who would give directions for routine tests to be made by the regular employee, and would make check tests at stated intervals. The number of consumers in a town where a clear, pure water is furnished are proportionately more numerous than where the water is turbid. Many people will use the clear, probably polluted, shallow well water in preference to a turbid or colored, though pure, city supply. Those who can afford it use bottled water rather than a poor city supply. I am indebted to Professor McKee of Lake Forest University for the state-

ment that three grocers in Lake Forest, Illinois, sold $9,600 worth of bottled water during 1907. Much of this money would have been saved or would have gone to the water company had the supply been satisfactory in all particulars.

It has been noted that a large percentage of the municipalities are supplied by water from wells. These wells may in general be divided into wells in rock, and wells in drift. While all the States have both classes of water, the problems differ materially acording to the location. In Michigan, Indiana, Illinois, Iowa and Missouri some of the deep rock wells furnish brines, or waters containing so much mineral matter that they are unfit for municipal supplies. The probability of a locality furnishing a satisfactory water from deep wells is quite well established by test wells covering practically all of the territory. The most widely distributed water-bearing strata are the St. Peters and Potsdam sandstone. These, outcropping in southern Minnesota and Wisconsin, dip to the south and furnish deep well water in Minnesota, Iowa, Wisconsin, Illinois, Missouri, and Indiana. To the south, the water from both strata becomes impregnated with salts, so that it is unsatisfactory for use for drinking purposes. In Illinois the line below which the waters are unsatisfactory for drinking purposes extends from near the southern extremity of Lake Michigan to Quincy. If the Illinois observations are borne out in the other States, satisfactory waters should be furnished in southern Wisconsin, in most of Iowa, and in northern Missouri.

Large portions of all the States in question are covered with glacial drift. A driftless area is found in Missouri, Illinois, southwestern Wisconsin, northeastern Iowa, and southeastern Minnesota. In the remainder of the States the drift varies in thickness from 5 to 300 feet, and in many cases there are pockets of greater or less extent containing water. This water is usually hard; in places containing an excess of carbonates, and in other places containing an excess

of sulphates. Water from both the rock and the drift wells when carefully cased contains no pathogenic germs, but in nearly all cases is harder than water from streams. When sufficiently soft, these wells furnish an ideal water supply for small towns. As mentioned before, the supply is usually inadequate for the needs of the greater municipalities. Trouble is sometimes experienced because of the presence of soluble salts of iron, which on exposure to the air are precipitated, and decolorize white earthenware. Attempts have been made to prevent this trouble by aeration and sedimentation, quite successfully at Elgin and Freeport, Illinois.

In all the States probably a majority of the population obtain water from shallow wells. A campaign of education is needed to cause the abandonment of these wells wherever another and better supply is available, or to teach the owners of the wells the proper method of constructing and caring for them. Recently the State Water Survey of Illinois caused samples of water to be collected from farm wells in five widely separated portions of the State. The conditions found were, on the whole, better than had been expected. At Elgin, near the northern part of the State, the majority of the ten farms visited obtained their water from wells in rock, about 175 feet deep. Chemically, the water was of fair quality, and from a bacteriological standpoint excellent. At Kankakee, about 60 miles south of Elgin, the majority of the wells examined were drilled in rock to a depth of from 30 to 60 feet. These wells furnished a water of good character, both chemically and bacterially. At Champaign, about 70 miles south of Kankakee, the majority of the wells were bored in the drift to a depth of from 150 feet to 170 feet, and furnished a water free from bacteria, though containing a considerable quantity of alkaline earth carbonates. At Centralia, about 100 miles south of Champaign, the most unsatisfactory conditions were found. All the wells examined were shallow dug wells, none of which were entirely

satisfactory for drinking purposes. At Cairo, in the extreme southern portions of the State, about 70 miles south of Centralia, the majority of the wells examined were driven in the alluvial drift, and while containing considerable iron, furnished a water that was hygienically good. In four of the five portions of the State in which investigations were made, the problem of obtaining pure water on the farms is a simple one. The deep well in rock or drift furnishes a satisfactory water supply. The condition at Centralia is undoubtedly typical of a considerable portion of the south central part of the State where very deep wells would furnish a brine, and where there is not enough water-bearing sand to allow driven, drilled, or bored wells, to be successfully used. In such cases there is great need of care to see that the dug wells are carefully located away from privies, cesspools or other sources of contamination, and that they be carefully cased and curbed to shut out all surface water.

Our conclusions concerning the water problems of Illinois, and, to a certain extent, of the neighboring States, may be briefly summarized as follows:

Lake water furnishes an abundant supply, the quantity of which will be excellent, providing proper precautions are taken to prevent the access of sewage, and to properly purify it before it enters the mains.

All river water must be purified in some way; in the northern portion of the district by slow sand filters; in the southern portion by coagulation and sedimentation and rapid filters.

The deep wells furnish an ideal supply for the smaller municipalities, provided they do not contain too much mineral matter and the iron content is low or may be removed.

The individual supply on the farm in portions of the district may be obtained from deep wells. In other portions care must be taken that the shallow dug wells be properly located and constructed.

WATER PROBLEMS OF THE MIDDLE WEST*

By Dr. R. J. MANION
Fort William, Ont.

The city of Fort William, Ontario, is situated on alluvial soil, north of the Kaministiquia river, and being only a few feet above the level of the river and very flat, sewage is rendered somewhat difficult to handle.

It has not been exactly a boom town, but it has grown very rapidly, and I can remember only a few years ago when water was delivered for all purposes by wagons which were filled on the banks of the Kaministiquia river with pails, the handiest spot being chosen, little heed being given to sewage contamination. The water was then sold to the citizens at fifteen or twenty cents per barrel.

Ten years ago, as the city became of greater size and importance, a water works system was installed. To take water from Lake Superior or Loch Lomond would have greatly increased the cost of the system, so it was decided to go on using the Kaministiquia water, more particularly since it had been used for years and no markedly ill effects caused by it, as Fort William, up to the time of the great epidemic in 1906, was a very healthy town. A pumping station was built on the bank of the river, just above the most populous part, but not above the whole town, and the intake pipe was made to reach for some distance up stream. Although this could not be claimed to be an absolutely pure water it was *at that time* a good water, as the river ran through a very thinly populated part of the country.

*Read before the American Public Health Association at Winnipeg, August, 1908.

As years passed, the city grew greatly in size, the part of the city above the intake pipe much more populous, the district more thickly settled, and gradually the water of the river became more and more polluted. Typhoid fever became little by little more prevalent, but as the increase was gradual it required an epidemic to awaken the citizens to their danger, and an awful awakening came.

The sewers from the west end of the city were emptying into the river above the intake pipe, and the population for twenty miles up the river had increased. To make matters worse, in the autumn of 1905 a steamer passing up the river dragging her anchor had broken the intake pipe about twelve feet from the shore, so that all the filth and sewage about the broken end was being sucked in and distributed by the city mains. The break was not discovered at first, and then there was some delay in its repair, as it was not repaired until about the end of January, 1906. Then it was only a matter of a little less pollution. By the end of 1905 typhoid was increasing so rapidly that notices were put up and a proclamation issued instructing every one to boil all drinking water. A well, 150 feet in depth, which had been bored before the water works system had been established, was re-opened. The well water is clear, hard and pure. It was delivered in wagons to the citizens free of charge, and the public were advised to use it alone for drinking purposes. Many disregarded these orders, some openly boasting of drinking river water. Of one prominent gentleman who asserted that he had never drunk anything but river water, it was said, that he had never drunk water in his life unless it was well diluted by good whiskey. The typhoid fever increased so rapidly that in seven days in February 161 cases were reported, and for the whole month 412 cases. Many practicing physicians were attacked.

It was during the latter part of February that I first practised in Fort William, and I believe I am within the

bounds when I say that for two months every physician in the city was attending from thirty to sixty patients per day. Dr. Douglas of Montreal arrived in the city the same day as I did, and he took charge of the outbreak for the city. He had all the houses where the disease broke out placarded, and had the inmates given all instructions as to isolation, disinfection, and so forth, to prevent other cases occurring. He insisted on all the physicians reporting new cases at once. He was assisted by Dr. Birdsall, Medical Health Officer, and the members of the Board of Health. He had the outbreak checked about the middle of April, after one of the worst epidemics in the history of Ontario.

Dr. Starkey, Professor of Hygiene in McGill University, Montreal, who was engaged on the recommendation of Dr. Hodgetts, I understand, to investigate this outbreak, gave in his report the following causes of the epidemic:

First, a polluted water supply.

Second, personal contact or personal infection.

Third, the unsanitary condition of the ground due to

(a) defective sewerage,
(b) the privy system,
(c) want of proper garbage disposal.

On August 1, following the outbreak, the medical health officer resigned and I was appointed. I continually kept before the public the importance of not using for drinking purposes unboiled water from any source except the deep well above mentioned. But despite all precautions, some 200 cases occurred between July 1, 1906, and January 1, 1907. The main cause of this was to my mind the carelessness of a great many people in neglecting to act on the advice, and in drinking the Kaministiquia water, which was still running through the taps. This carelessness was unnecessary, as the city was distributing free the pure water from the deep well.

The Board of Health has kept on from that time to the present impressing upon the citizens the importance of drinking unboiled only the well water, and gradually the whole city has realized how important is this advice, as the following figures will show.

Year	No. of cases	Deaths	Population.
Nov. 1, '05—Nov. 1, '06	900	90	9,000
" '06— " '07	77	9	12,000
" '07—Aug. 1, '08	9	0	15,000

i. e., the past nine months.

That is, during the year of the epidemic there was one case of typhoid in every ten and one death in every hundred people, whereas in the past nine months, only nine cases occurred with no deaths.

And the only change of importance was the carefulness of the citizens in regard to the water which they drank.

True, the sewerage system has been improved, the privy system lessened, a method of garbage disposal introduced, and dairymen and soft drink manufacturers instructed to use only the deep well water for cleaning their utensils, and so forth, but these are of minor importance in comparison to purer water being used for drinking purposes.

It is to be regretted that the city is still supplied from the same water source, except for the delivery wagons, as it was during the epidemic over two years ago. But this is the fault of accident.

As soon as the citizens had time to think they decided on procuring water from a more satisfactory source. As a temporary source it was decided to utilize Crescent lake, a small body of water about three miles from the city, and work was at once begun. But unfortunately, the Crescent lake scheme proved a failure, and so it has been necessary to wait till the permanent system was completed. For a

permanent source they had a choice of installing a filtration system and taking the water from Lake Superior, or, of getting a water pure at its source from Loch Lomond. As the latter scheme involved a much smaller outlay it was decided upon.

John Galt, the consulting engineer, of Toronto, whose advice was asked, spoke in favor of this scheme. He describes the lake in the following words: "Loch Lomond is situated about seven miles from the city, at an elevation of 333 feet above the Kaministiquia river. It is a beautiful body of soft, clear, pure water, free from all contamination, and a delightful water for all general and domestic purposes." Mr. Galt then gave the city the estimated cost and an outline of the necessary work.

The lake is about ten square miles in extent, and at some places is 200 feet deep. It is fed by an area of about fifty square miles, and it is situated on a plateau among a range of hills southwest of the city. It has no source of pollution so long as the watershed is protected.

Not only is the water of this lake perfect from a sanitary standpoint, but by damming the outlet at Carp river the supply would be abundant for a population of a quarter of a million.

This supply will be brought to the city by a natural gravitation system. But as the lake is on the other side of Mt. McKay, a tunnel one mile long and six feet square is being driven, and is nearly completed, through solid rock. A large reservoir has been built about one mile from the end of the tunnel, from which reservoir the water will be conveyed by cast iron piping under the river and distributed through the city mains, making it an engineering problem of large size. The work is being done under the supervision of H. Sydney Hancock, the city engineer, with the assistance of Captain John King.

DISEASES FOUND IN THE INTERIOR OF THE NORTHWEST OF CANADA *

Sanitary Precautions and Results

By Dr. J. H. O'DONNELL
Winnipeg, Manitoba

Ruperts Land comprised all that portion of the Northwest whose waters emptied into the Hudson Bay. The Hudson Bay Company were the sole governing body, civil and criminal. In the territories, the Hudson Bay Company had but trading rights, which practically covered everything, although all legal matters were attached to some of the Judicial Districts of Lower Canada, and Upper Canada before confederation, Quebec, and sent there for adjustment. The .health of the population, so far as it was possible, depended entirely upon physicians brought into the country by the Hudson Bay Company, and as a rule they were men of culture and learned in their profession, which enabled them to make extensive and valuable observations.

The population, aside from the aboriginal tribes, consisted mainly of Scotch, French, English, and some Irish. The Scotch and Irish were descendants of the original Selkirk settlers, and some members of the Sixth Regiment that for a time were stationed on some of the lakes, taking their discharge.

The pure half-caste was, as a rule, a very healthy individual, the farther removed became less vigorous, and, as a rule, inherited the tubercular diathesis of the Indian

*Read before the American Public Health Association at Winnipeg, August, 1908.

mother; the same holds good in the admixture of races throughout all nationalities.

Far in the interior, scurvy was really a scourge, and became a menace to public health generally. When an error in diagnosis occurs, as I shall attempt to show, malignant smallpox may be *mistaken* for scurvy, and was the cause of a frightful epidemic among the Indians in the West, that nearly destroyed whole tribes, and was quelled with great difficulty, owing to the belief that the disease was brought to them by the white men, and it was, as we shall see.

In cases of malignant smallpox, we have much the same condition to be exhibited in scurvy. We have the same condition of the gums, vibices, hemorrhages from various parts of the body, the spots (or eruption) are flat, red blue, or purple, and contain blood or sanious ichor, in the place of pus, constituting the variola nigrae of Sydenham, the bloody smallpox of Mead. We have hemorrhages from the fauces, nose, the gums become spongy and bleed similar to the condition in scurvy, and in many cases of this form of the disease, the only feature of the malady developed or observable before death is the condition of the gums and fauces.

In 1870 smallpox broke out among the plain Indians of the West, and became epidemic. A physician was sent out from here by the Government to vaccinate them, and make all the necessary sanitary arrangements to check the progress of the disease.

At the time no trace whatever could be ascertained as to how the disease appeared, or from whence it came. There had been no persons from outside points for three months before the outbreak. The following spring, I was treating a case of pneumonia in the hospital. The man had been a miner in British Columbia, and with a small party had crossed the mountains and remained for some time near Edmonton. In speaking of the smallpox among the Indians, he said he could tell just where it came from. His state-

ment was that a young man of the party of miners who started to cross the Rocky Mountains to Saskatchewan, soon after starting became ill with what they all thought was scurvy; he became rapidly worse, and death came suddenly from hemorrhage. An Indian who was acting as a guide, and at the time was going to meet some hunters in the mountains, took an overcoat belonging to the dead man that had been used very little, and after assisting to bury the corpse, left the little party to visit the camp of the mountain trappers. This Indian sometime after appeared in a camp of Indians on the plains, who were relatives, wearing the coat that had belonged to the dead man. Within a fortnight after, several of the Indians were taken with smallpox of a grave type; death followed in more than half of the cases. The Indians became panic-stricken, and scattered in every direction, distributing the malady everywhere, and the result, of course, was very lamentable.

The suspected case of scurvy in the mountains was in reality smallpox, and the dead man's coat brought in by the Indian guide was put on by the brave to make a good impression among his people. The coat was the article which carried the infection that caused the death of so many Indians and many white people, who fell victims while striving to check the progress of the epidemic.

The following year when the plain hunters came to Fort Garry to sell the buffalo robes and small furs, although robes from the stricken districts were prohibited, many found their way in, and in one case I was sent with an officer and witnessed the destruction of four hundred robes. The authorities were so alarmed that they would not listen to the advice given by Dr. Bird and myself, to have them sterilized. They insisted on destruction, and they were burned.

Quite a long time having elapsed, and the epidemic having died out, a few bales of robes found their way to Winnipeg. They were prime robes, and were sold single or in pairs,

all being disposed of quickly to persons who could pay a high price. Soon after a young married man in St. Boniface became ill, and the cause was diagnosed scurvy. In conversation with the attending physician, when he mentioned that the gums were swollen and bled profusely on the slightest touch, I suggested isolation, as it might be malignant smallpox. The case terminated fatally within a few hours, and the doctor felt sure it was one of scurvy.

Within a few days his brother became ill; he had a high fever and violent delirium from the outset, and was sent to the hospital. I saw the case soon after his admission, and was satisfied it was smallpox. The delirium was constant. I warned them, unless carefully guarded, he would be likely to escape, which he afterwards did, and made his way in the darkness across the prairie until he fell from exhaustion and cold, and died. He was found twenty-four hours after. The eruption was then apparent almost all over the body. The two cases mentioned were sons of the late Commodore Kitson, St. Paul, Minnesota.

The Hudson Bay Company had in the interior and in the far North, different forts or posts, and some were designated "meat stations," that is where they had very little flour for bread, and their food consisted almost altogether of flesh meat. Other posts were known as "fish stations," where the food for the greater part of the year consisted of fish. The latter stations suffered less from disease than the former. In the part of the country where animal food was their principal food, they suffered from Bright's disease and diabetes, erysipelas, and hepatic inflammations and dysentery, occasionally of a bad type, and occasionally cases of rheumatism and pneumonia.

At the fish stations and surrounding country, they had very little renal affections, no albuminuria or diabetes, unless inflammatory conditions from cold, and occasional cases of renal calculi. They had skin affections in great variety.

From the "meat stations" persons thus suffering from renal or hepatic affections were usually sent to "fish stations," and very generally improved thereby. The skin affections in many instances were specific, the primary disease having been contracted prior to entering the country. Medical stores, of course, in such a remote place, were limited, and the cases were treated by the administration of "Donovan's Solution" and mercurial local applications.

Tubercular affections other than pulmonary were not frequent, rarely in joints, and when developed, a sequence of an injury, as a rule.

In the Selkirk settlement, when a youth developed phthisis, they were usually sent out with the plain hunters for a year or two, and in most cases recovered permanently. Goiter was common in families that spent most of their time trading with the Indians in the Saskatchewan country; so observable was it the case, that it was named and always spoken of by the Selkirk settlers, as the "Saskatchewan disease." Those affected that came to live here generally improved with no other treatment than boiling the water or precipitating the permanent hardness in any way. In the Selkirk settlement there were cases of epitheliomia, the exciting cause from smoking mostly. An occasional case of "charbon" was to be met with, which was well understood by the physicians here at the time. I was surprised to find the use of animal ligatures by the late Drs. William Cowan and Bird, the fine fibre of sinew sterilized by being immersed for a time in alcohol, ether and hot water. In amputations the ordinary charpie bandage was used to drive the blood up into the trunk—quite as good a thing as the Esmarch. The stump was washed with hot water, alcohol and ether, and good results were as common as now.

THE COMMERCIAL PASTEURIZATION OF MILK*.

By B. R. RICKARDS

Columbus, Ohio †

ABSTRACT

The pasteurization of milk is a subject which has received its due share of attention in the last few years. As a very natural sequence to the epidemic traced to milk and also due in part, no doubt, to the establishment of bacterial milk standards by health boards, we find an increasing tendency on the part of the milk producers and milk contractors or handlers toward the pasteurization of their product.

Three of our large contracting milk firms were in 1908 pasteurizing a large proportion of their milk, two pasteurizing practically all of their bottle trade, a third pasteurizing all his milk except that sold to milk peddlers.

Each of the three different firms pasteurizing milk for the Boston trade use a different make of machine, each machine being radically different from the others.

At least four visits were made to each concern for the purpose of taking samples. On each trip an average of twenty samples were taken, ten as the milk went into the machines, and ten as it came from the cooling apparatus, the time limit between the taking of the two sets of samples being adjusted as closely as was possible to the time

*Read before the American Public Health Association at Winnipeg, August, 1908.

*The collection of specimens and the laboratory work on which this paper is based was by W. M. Campbell, Milk Bacteriologist.

†Written while Director of the Boston Board of Health Laboratory

necessary for the milk to pass through the apparatus, so that the same lot of milk, practically speaking, was tested before and after the process.

TABLE NO. I.

Firm	No. of Samples Taken	Milk exposed to air during	Temperature			Time exposed to heat
			Before	During	After	
X	36	Entire process	38-50 F	154-160	43-48	Est. 3 min.
Y	40	Cooling only	47-54	140-148	48-50	20 "
Z	50	"	52-58	158-165	46-52	Est. 3-5 min.

It will be seen that the machines in which the milk is exposed to heat for a short period of time are heated to a higher temperature than the one which holds the milk for twenty minutes.

According to Rosenau* 140° F. for two minutes is sufficient to kill the diphtheria, typhoid and dysentery organisms, but at least twenty minutes at 140° F. are necessary to kill the bacilli of tuberculosis. A momentary exposure at 160° will, however, kill the latter.

It is evident, then, that as far as the organisms mentioned are concerned, with the possible exception of *B. tuberculosis,* the processes as ordinarily carried on are sufficient to kill, and we may safely infer that the infecting material from other diseases, such as scarlet fever, would also succumb. While the control of the temperature is left to human hands, however, there is likelihood of the temperature falling low enough at times to fail to kill and even acting to multiply the organisms. One instance of this will be noted later. In addition, one must bear in mind the possibility of infection of milk by handling subsequent to pasteurization.

* Bulletin 42. Hygienic Laboratory, U. S. P. H and M. H. S., p. 82.

Out of 125 samples taken at different times, only 22 samples, or 18 per cent., were below the limit of 500,000 bacteria per c. c. The average count of each dealer was above this limit. As samples were taken at different periods between the first of March and the middle of June, 1908, some allowance may be made for the extremely hot weather during the latter part of that time. It is, nevertheless, apparent that a certain proportion of the milk going into certain of the machines was of higher bacterial content than should be allowed to be pasteurized.

TABLE NO. II.

EFFECT OF PASTEURIZATION

Contractor	Total	Average count before pasteurization	Average count after pasteurization	% Efficiency	
X	27*	688,000	15,000	97.7	Based on all first day counts
Y	39	881,000	9,750	98 9	
Z	50	3,576,000	273,000	92.4	

The above table shows the amount of and percentage reduction by pasteurization in the number of bacteria contained in the milk. In a milk previously of high bacterial content, we have, after pasteurization, all the dead and disintegrating bodies of the bacteria, all the bacterial products previously formed in the milk and to some extent probably unchanged by the heating, plus in some cases an amount of cooked dung and dirt varying with the original condition

*In one set of experiments this pasteurizer was evidently not being run successfully, the pasteurizer acting not as such but as an incubator. For the sake of comparison this set of nine tests is omitted from the above table and given below.

Before pasteurizing		After pasteurizing		
716,000	:	2,196,000	:	Increase 30% (Approx.)

of the sample. By the reduction of the number of bacteria through the heating process, the criterion by which we now judge a dirty, old or improperly kept milk, is temporarily lost. It is undoubtedly true that what organisms are left multiply with greater rapidity than before in the pasteurized milk, as shown in the following table:

TABLE NO. III.

SHOWING RELATIVE INCREASE IN BACTERIA IN PASTEURIZED AND UNPASTEURIZED MILK AT ICE BOX TEMPERATURE

	Unpasteurized milk Average count	Pasteurized milk Average count	No. of Samples
1st day	1,087,000	44,000	87 (based on those samples on which a 24 hr. count was obtained.)
After 24 hours in ice chest	22,617,000	3,691,000	
% increase	2,100	8,400	
Ratio	1	4	

In other words, on the average, bacteria will increase four times as fast in pasteurized milk than in unpasteurized milk when kept twenty-four hours at the temperature of the ice box. This figure coincides almost exactly with that obtained by St. John and Pennington in Philadelphia.*

Pasteurized milk seems to keep longer, but eventually acquires a strong odor and really may be said to decompose rather than sour. In nearly every instance we found the pasteurized milk, though heavily loaded with bacteria, did not decompose until after the unpasteurized milk taken at the same time had curdled. That such milk is unfit for food—especially for babies—goes without saying.

*St. John and Pennington, Journal Infectious Diseases, Vol. 4, p. 647.

Effect of Pasteurization on the Bacterial Analysis of Milk

In addition to the fact that we are obliged to pass dirty milk recently pasteurized because of its low count, we have found during this investigation that pasteurization affects our results in two other ways. In the direct microscopic examination of the milk sediment we have been able by means of Dr. Slack's method to make a close estimation of the number of bacteria present, thus "passing" such samples as were evidently below the limit of 500,000 bacteria per c. c. At the same time samples showing streptococci, increased leucocytes or pus were detected. In pasteurized milk the leucocyte estimate is much larger on account of the greater precipitation of cells in milk that has been heated, this result confirming the results reported by Russell last year before the Laboratory Section of the American Public Health Association. We have also noticed a higher bacterial estimate as compared with plate counts from the heated milk. This is probably due to such milk containing a large number of dead bacteria or bacteria so affected by heat as to be incapable of reproduction.

SUMMARY.

1. A large amount of milk is pasteurized in Boston every day. Some of the milk of one contractor is pasteurized in the country and is again pasteurized here.

2. The amount of milk pasteurized is probably increasing.

3. Some of this milk is of very high bacterial content.

4. Bacteria will increase much faster in pasteurized than in unpasteurized milk.

5. The pasteurization of milk affects the microscopic estimate of bacteria and leucocytes.

CONCLUSIONS.

1. Commercial pasteurization of milk *without restriction*

puts a premium on dirty milk, since dirty and old milk, otherwise unsalable, can then be put on the market.

2. Pasteurized milk may well mean cooked dirt, cooked dung and cooked bacterial products, and the laboratory is powerless to detect it, unless apparent to the naked eye.

3. The commercial pasteurization as at present practised in Boston, probably would destroy all disease-producing organisms, with the possible exception of the bacilli of tuberculosis. The latter would probably be killed in the majority of instances. One machine only out of the three tested would be likely always to destroy the latter. The toxins produced by these and by the putrefactive organisms in dirty milk would undoubtedly escape unharmed and in many cases be capable of producing severe intestinal disturbances—especially in babies.

4. A false sense of security is undoubtedly conveyed by the term pasteurized milk. The lack of security may come from either improper pasteurization, the pasteurization of improperly handled milk or improper care of pasteurized milk.

5. The unrestricted pasteurization of improperly kept, old or dirty milk should be prevented by regulations or ordinances prohibiting the pasteurization of milk containing over a certain specified number of bacteria per cubic centimeter, the bacterial limit being set with due regard to local conditions, especially the distance from which the milk comes. Such regulation should, of course, be coupled with a regulation forbidding the sale of milk above the bacterial limit established.

6. The law should require that milk heated above 140° F.* should be marked heated or pasteurized milk. Pasteurized milk should not be sold as fresh milk.

*The Massachusetts Legislature of 1908 passed an act requiring the labeling of all milk heated above 167° F. "Heated Milk." The law as it stands is useless.

The pasteurization of milk in itself is probably not a harmful process, and is, perhaps, to a certain extent a necessity under modern conditions in large cities, but *commercial* pasteurization should be carried on only under the most stringent supervision.

OFFICIAL REPORT OF THE PROCEEDINGS OF THE THIRTY-SIXTH ANNUAL MEETING HELD AT WINNIPEG, MANITOBA, AUGUST 25, 26, 27, 28, 1908.

TUESDAY, AUGUST 25.

The Association met at the Royal Alexandra Hotel, presided over by the President, Dr. Richard H. Lewis of Raleigh, North Carolina.

On motion of Professor Robinson the reading of the minutes of the thirty-fifth annual meeting was dispensed with.

The following new members were elected:

Baker, Thomas H., M.D., 1613 Story Avenue, Louisville, Ky.

Baton, Warren U. C., 340 Melwood Street, Pittsburg, Pa.

Bell, Fred C., 121 Carleton Street, Winnipeg, Manitoba.

Bell, Robert W., M.D., 51 St. Vincent Street, Toronto, Ont.

Bissonnette, P. J. L., M.D., St. Esprite, Quebec.

Bjornson, O., M.D., 620 McDermott Avenue, Winnipeg, Manitoba.

Black, William, M.D., 159 Edmonton Street, Winnipeg, Manitoba.

Bleile, Albert M., M.D., 218 King Avenue, Columbus, Ohio.

Bond, J. H. P., M.D., Bannatyn Avenue, Winnipeg, Manitoba.

Brown, Raymond, M.D., Main Street, Winnipeg, Manitoba.

Burridge, Arthur J., M.D., 125 Furby Street, Winnipeg, Manitoba.

Cadham, F. T., M.D., Main Street, Winnipeg, Manitoba.

Campbell, Alexander M., M.D., 95 Sherbrooke Street, Winnipeg, Manitoba.

Campbell, Spurgeon, M.D , 326 Somerset Block, Winnipeg, Manitoba.

Carpenter, Thomas B., M.D., 533 Franklin Street, Buffalo, N. Y.

Caulfield, Alfred A., M.D., corner Bloor and Yonge Streets, Toronto, Ont.

Chestnut, W., M.D., Sherbrooke Street, Winnipeg, Manitoba.

Chown, Henry H., M.D., Broadway, Winnipeg, Manitoba.

Cleghorn, I. M., M.D., Baldur, Manitoba.

Clock, Ralph O., M.D., 42 West Broad Street, Burlington, N. J.

Closson, Oliver E., Marietta, Pa.

Cobb, Charles H., Arcade Building, Kankakee, Ill.

Corbett, S. C., M.D., Armstrong's Point, Winnipeg, Manitoba.

Connell, Walter T., M.D., 11 Arch Street, Kingston, Ont.

Cornman, Ernest L., V.M.D., Marietta, Pa.

Cox, F. J. C., Main Street, Winnipeg, Manitoba.

Davidson, J. R., M.D. Broadway, Winnipeg, Manitoba.

del Raso, Emilo, M.D , Mexico City, Mexico.

Elkin, S. J., M.D., 222 Portage Avenue, Winnipeg, Manitoba.

Evans, Wm. Augustus, M.D., 103 State Street, Chicago, Ill.

Evans, W. Sanford, Edmonton Street, Winnipeg, Manitoba.

Fagan, C. J., M.D., Vancouver, B. C.

Fell, Alton S., M.D., 12 East State Street, Trenton, N. J.

Ferguson, Meade, Ph D., 1110 Capitol Street, Richmond, Va.

Foster, Walter B., M D., 6 East Grace Street, Richmond, Va.

Foyle, Timothy F., 142 Hudson Street, Newark, N. J.

Grice, Joseph, M.D., Portsmouth, Va.

Guerola, Nicolas, M.D., Mexico City, Mexico.

Gunn, J. A., M.D., General Hospital, Winnipeg, Manitoba.

Hall, Pearl M., M.D. 1607 Fremont Avenue North, Minneapolis, Minn.

Hamilton, T. Glenn, M.D., 264 Renton Avenue, Winnipeg, Manitoba.

Hamilton, William T., M.D., High River, Alberta, N. W. T.

Hanchett, Alfred P., M.D., 201 City National Bank Building, Council Bluffs, Iowa.

Harding, Harry A., N. Y. Agr. Experiment Station, Geneva, N. Y.

Harris, D. L., M.D., St. Louis, Mo.

Hastings, T. W., M D., 20th Street and 1st Avenue, New York, N. Y.

Holm, Marinus L., M.D., 316 Capitol Avenue, Lansing, Mich.

Houston, John, M.D., Cypress River, Manitoba.

Hudson, Arthur, 265 Washington Street, Newton, Mass.

Irving, L. E. W., M.D., Edmonton, Alberta, N. W. T.

Irving, J. F., Yorkton, Sask.

Jennings, Fred H., 121 South Pleasant Street, Watertown, N. Y.

Keator, Bruce S., M.D., Asbury Park, N. J.

Laberge, Louis, M.D., City Hall, Montreal, Quebec.

Lafferty, James D., M.D., 202 Seventh Avenue West, Calgary, Alberta.

Lambert, Joseph H. O., M.D., St. Boniface, Manitoba.

Leaman, A. G., 446 Arthur Street, Port Arthur, Ontario.

Lederer, Arthur, M.D., 4843 Langley Avenue, Chicago, Ill.
Leeming, John H., M.D., City Hall, Winnipeg, Manitoba.
Lopez, Miguel M., M.D., Guadalajara, Mexico.

McArthur, J. A., M.D., Canada Life Block, Winnipeg, Manitoba.
McClintock, Charles T., M.D., Detroit, Mich.
McGlaskan, C. C., 107 Tache Street, Winnipeg, Manitoba.
McKay, Hugh, Winnipeg, Manitoba.
McKay, W. J., M.D., Saskatoon, Sask.
McMunn, R. S., M.D., 180 Selkirk Avenue, Winnipeg, Manitoba.
McDonell, John, M.D., Royal Alexandra Hotel, Winnipeg, Manitoba.
Maclean, Neil J., M.D., 326 Somerset Building, Winnipeg, Manitoba.
Mason, Charles F., M.D., U. S. Army, Washington, D. C.
Meek, E. E., M.D., Virden, Manitoba.
Miller, Edgar C. L., M.D., 66 Rosedale Court, Detroit, Mich.
Milroy, Thomas M., M.D., Donald Street, Winnipeg, Manitoba.
Monfort, Wilson Forsythe, 77 May Street, St. Louis, Mo.
Marrion, R. J., M.D., May Street, Fort William, Ont.
Moody, A. W., M.D., 156 Donald Street, Winnipeg, Manitoba.

Newton, McGuire, M.D., 1010 Floyd Avenue, Richmond, Va.
Nims, Boyden, Room 20 Kendall Building, Columbia, S. C.
North, Charles E., M.D., 39 West 38th Street, New York, N. Y.

O'Donnell, John H., M.D., Portage Avenue, Winnepeg, Manitoba.
Owens, R. B., C.E., Edmonton, Alberta, N. W. T.

Patterson, James, M.D., Donald Street, Winnipeg, Manitoba.

Perrow, Mosby G., Lynchburg, Va.

Philbrick, Burton G., 1014 Broadway, Oakland, Cal.

Pierce, S. J. S., M.D., Donald Street, Winnipeg, Manitoba.

Popham, E. S., M.D., corner Ellice and Hargrave Streets, Winnipeg, Manitoba.

Prouse, Samuel W., M.D., 497 River Avenue, Winnipeg, Manitoba.

Puchot, Gaston, M.D., Matamoras, Tamaulipas, Mexico.

Ranshaw, Willis W., M.D., 805 Madison Street, Covington, Ky.

Rattan, Henry N., City Hall, Winnipeg, Manitoba.

Ritchie, John, Jr., Old Court House, Boston, Mass.

Rogers, W., M.D., corner of Main and Portage Streets, Winnipeg, Manitoba.

Ross, D. G., M.D., Selkirk, Manitoba.

Ruediger, Gustav F., M.D., Grand Forks, N. D.

Santee, Ellis M., M.D., 23 Groton Avenue, Cortland, N. Y.

Schneider, Franz, Jr., 36 Summer Street, Lawrence, Mass.

Seymour, Maurice M., M.D., Regina, Sask.

Smith, W. Harvey, M.D., 223 Roslyn Road, Winnipeg, Manitoba.

Stewart, D. A., M.D., General Hospital, Winnipeg, Manitoba.

Taylor, William E., 515 Ohio Street, Terre Haute, Ind.

Thomas, Louis A., M.D., State House, Des Moines, Iowa.

Todd, J. O., M.D., Hargrave and York Streets, Winnipeg, Manitoba.

Underhill, Frederic T., M.D., Vancouver, B. C.

Uribe, Esteban, M.D., Toluca, Mexico.

Vrooman, C. H., M.D., 381 William Avenue, Winnipeg, Manitoba.

Wadge, Herbert W., M.D., 754 Logan Avenue, Winnipeg, Manitoba.

Warren, George L., M.D., 77 Houston Street, Newark, N. J.

Watkins, Frank L., M.D., 515 Harrison Building, Columbus, Ohio.

Whitelaw, T. H., M. D., 408 Third Street, Edmonton, Alberta, N. W. T.

Wilson, Thomas, City Hall, Winnipeg, Manitoba.

Following the reading of the report of the Committee on Ophthalmia Neonatorum by Dr. F. Park Lewis, Dr. Hurty was requested by the President to prepare a resolution relative to the publication of the report.

Following the papers and discussion on vaccination and smallpox, Dr. W. A. Evans of Chicago, Ill., moved that a committee be appointed to prepare an argument as to the efficacy of vaccination and that the American Public Health Association devise some means for dissemination of the report, and that some effort be made toward a simultaneous and concerted movement throughout the country in opposition to the anti-vaccination movement.

At the evening session of this day the President read his annual address.

WEDNESDAY, AUGUST 26th.

The Secretary announced that the Executive Committee had approved the constitution of the Section of Municipal Health Officers and recommended the same to the Association for adoption. The constitution was read by Dr. H. W. Hill, and on motion of Dr. Hurty, duly seconded, the same was adopted.

The new Constitution and By-Laws for the Association were then read by Professor Robinson and referred to a subsequent session for a vote.

The Treasurer, Dr. Frank W. Wright, presented the following report:

RECEIPTS.

1907		
October 3.	Cash on hand	$1,746.10
	Received from dues for 1905	5.00
	Received from dues for 1906	130.00
	Received from dues for 1907	2,010.00
	Received from dues for 1908	35.00
	Received from sale of Transactions	359.05
		$4,285.15

DISBURSEMENTS.

1907.			Order No.	Amount
October	15.	C. O. Probst	246	$87.35
"	30.	Frank W. Wright	247	94.68
"	30.	American Express Co.	248	28.85
"	30.	U. S. Express Co.	249	31.64
"	30.	Adams Express Co. ...	250	24.33
"	30.	Wells-Fargo Co. Ex. ...	251	32.02
December	7.	F. J. Heer Printing Co.	252	1,168.50
"	7.	Globe Printing Co. ...	253	14.00
"	7.	F. L. Covell	254	3.00
"	7.	H. W. Hill	255	25.85
"	7.	Nora C. O'Donoghue...	256	13.00
"	7.	William Whitford	257	215.15
"	7.	Adams Express Co. ...	258	5.62
"	7.	Wells-Fargo Ex. Co...	259	3.57
"	13.	American Journal Public Hygiene	260	125.00
1908				
March	7.	W. B. Gray	261	5.00
"	7.	John A. Hauff	262	15.00
"	7.	Dr. M. G. Overlock ..	263	5.00

April	7.	N. J. Bartlett & Co....	264	1.25
"	7.	American Journal Public Hygiene	265	125.00
June	1.	Adams Express Co....	266	21.58
"	1.	U. S. Express Co......	267	18.69
"	1.	Wells-Fargo Co. Ex...	268	24.81
"	1.	American Express Co..	269	22.38
"	1.	Frank C. McElroy	270	13.50
"	1.	G. E. Stechert & Co....	271	13.50
"	1.	F. J. Heer Printing Co.	272	739.29
July	2.	American Journal Public Hygiene	273	150.00
"	2.	F. J. Heer Printing Co.	274	25.00
"	8.	H. W. Hill	275	69.05
"	8.	F. C. Robinson	276	12.00
"	8.	C. O. Probst	277	300.00
"	28.	Frank W. Wright	278	30.00
"	28.	American Journal Public Hygiene	279	205.00
August	1.	Balance on hand		616.54
				$4,285.15

On motion of Dr. Hodgetts the report of the Treasurer was referred to an Auditing Committee. The President appointed on this committee, Prof. Edward Bartow, Dr. William Delano and Mr. B. R. Rickards.

THURSDAY, AUGUST 27th.

The Secretary reported that the Executive Committee recommended the adoption of the motion by Dr. Evans in re a committee on vaccination with the further recommendations that a committee of seven members be appointed to carry out the provisions of the resolution.

On motion of Prof. Robinson the Association adopted the resolution and recommendations of the Executive Committee.

The Executive Committee reported back the following resolution offered and approved by the Section on Vital Statistics with the recommendation that it be carried.

Resolved, That the draft of a model law for the registration of births and deaths in the United States, based upon the essential requirements of registration as laid down by the American Public Health Association in conjunction with the United States Bureau of Census, and approved by the American Medical Association (and by the Conference of Commissioners on Uniform State Laws), be cordially endorsed by the American Public Health Association, and that the Committee on Legislation of the Section on Vital Statistics be authorized to co-operate on behalf of this Association with the representatives of the other organizations named, and with the Bureau of Census in making such minor changes as may be necessary and in urging the adoption of such legislation in non-registration States.

On motion the resolution was adopted.

The Secretary announced that the Executive Committee had considered the recommendation in the President's address that a committee be appointed, residents of the United States, for consultation and co-operation with the Natural Resources Commission, and recommended that such a committee be appointed from the Association for co-operation.

On motion the recommendation was adopted.

The Executive Committee recommended the appointment of an historian of the Association, and recommended Dr. William Bailey, of Louisville, Kentucky, for the position.

On motion of Dr. Baker, of Louisville, the recommendation was adopted.

The Executive Committee recommended that a Committee on Necrology be appointed as a new committee of the Association. On motion of Dr. Hill the recommendation of the Executive Committee was adopted.

The Auditing Committee submitted the following report:

"Your committee has examined the books and vouchers of the Treasurer and found them correct.

(Signed) EDWARD BARTOW
B. R. RICKARDS
WILLIAM DELANO

On motion of Dr. Stanton the report of the committee was accepted and the committee discharged.

Dr. H. W. Hill presented the following resolution relative to publication of a journal:

WHEREAS, Public hygiene, originating as a side growth from the observations of therapeutists, engaged in treating the sick, has through general scientific advance, particularly in vital statistics, bacteriology, chemistry, engineering and other related technicalities, become a definite and distinct scientific profession.

And WHEREAS, The professional public hygienist, who has pushed steadily forward, through the years of inevitable mistake, misunderstanding, neglect and disdain incident to the birth of a new science, now sees in the developments of the last two years a most striking and widespread recognition and appreciation of the enormous importance of public hygiene.

And WHEREAS, The American Public Health Association, alone amongst the national or international medical or scientific organizations of this continent, has for thirty-six years consistently fostered public hygiene, by affording a

place of conference, a rallying point for mutual encouragement, a mouthpiece for hygienic endeavor, warning and advice, and a centre for the unification of methods and advance in practice.

And WHEREAS, Notwithstanding the critical professional responsibilities and the large statutory powers of the professional public hygienist, demonstrated most prominently in handling epidemics, but also day by day in the less spectacular but far more important matter of *preventing* epidemics as well as in improving the physical conditions of life of the everyday citizen, and notwithstanding that the professional public hygienist is a most important factor in modern community life, yet the members of this profession, necessarily few in numbers and widely scattered, lack the hearty fraternal support and encouragement in their daily work which other professions, having many members in each community, may freely enjoy.

And WHEREAS, In other professions, individual effort reaps a reward in individual advance, but in professional public hygiene, individual effort reacts chiefly upon the advance of the community, and seldom secures financial or professional advance to the individual concerned.

Be it resolved: 1. That the profession of public hygiene presents many features sharply distinct from those presented by the other professions.

2. That the opportunity for interchange of thought, for consultation and conference, even for securing, through reading, a knowledge of current practice and new developments, for long open to other professions, is almost wholly lacking to the professional public hygienist, because of his relative isolation and because of the comparative absence in this country of such literature.

3. That the isolation of the professional public hygienist is obviously irremediable, and makes the possession of high-

class professional literature even more important to him than to the physician, lawyer or engineer.

4. That a journal for public hygienists should therefore be established, that the very profession which peculiarly requires such a journal shall no longer be the only profession which does not possess one.

5. That the burden of the financial support of such a journal, readily borne in the case of other professions by subdivision of expense amongst their relatively numerous members, and properly borne by the individual member of such professions, because it reacts to his own personal advancement, should not be borne by the individual practitioner of public hygiene, because it is chiefly of value to the public, and cannot be so borne in any case because of the relatively small number of individuals amongst whom the expense must be divided.

6. That such a journal should be edited, controlled and published by profesional public hygienists, for professional public hygienists; and that it should therefore be under the direction and control of the one representative association of professional public hygienists, the American Public Health Association.

7. That the endowment of such a journal from private funds would afford to the donor a rare opportunity to serve the public interest in no less a manner than in the upbuilding and advance of that profession which now legally and actually is in charge of the public health and which is here and now daily concerned in the actual conduct of public health affairs throughout the communities of this continent.

8. That the committee representing this Association be authorized and instructed to lay this matter before such persons or agencies who, devoting themselves to the private financial support of public interests, have demonstrated by previous benefactions in other similar directions, a sympathy

with large practical movements for the upbuilding of the community, the nation and the race. Such committee to have full power to represent the Association and enter into legal agreements.

This resolution was referred to the Executive Committee to report back on Thursday.

Dr. John N. Hurty of Indianapolis offered the following resolution, which was referred to the Executive Committee:

Resolved, By the American Public Health Association, That it heartily recommends to the American Congress the passage of such legislation as is intended to enlarge the scope and increase the efficiency of the Public Health and Marine Hospital Service. To this end the Association believes the powers of the Service should be increased; that provisions should be made for the retirement under pay of the members of the Service, and that the salaries of the said members should be made commensurate with the Medical Service of the Army.

The Secretary shall send a copy of this resolution to the Chairman of the House Committee on Interstate and Foreign Commerce, and to the corresponding committee in the Senate.

Dr. Hurty presented the following resolution prepared at the request of the President:

Resolved, That the Secretary of this Association shall publish at the earliest possible date the report of the Committee on Ophthalmia Neonatorum in the Journal of the American Medical Association, or other medical journal, and that he shall have two thousand reprints made and distribute the same according to his judgment, subject to the approval of the Publication Committee.

The resolution was referred to the Executive Committee.

The following resolution by Dr. William A. Evans of

Chicago was recommended for adoption by the Executive Committee:

Resolved, That it is the sense of the American Public Health Association that in cities of 300,000 and over, the next census should be taken on the basis of city blocks.

[No subsequent action was taken on this resolution by the Executive Committee or the Association. The resolution was referred to the Committee of Seven for action, and by vote of this Committee was adopted, and a copy of the same was sent to the Bureau of the Census.—SECRETARY.]

Prof. Robinson presented the report of the Committee on Constitution and By-Laws. The constitution and by-laws were read section by section, amended and adopted.

Dr. Hurty then moved that the constitution as a whole be adopted, which motion was seconded and carried. On motion of Dr. Bryce, it was voted to put the constitution into effect immediately after the close of this meeting to the extent necessary to carry on the regular work of the Association. [The Constitution and By-Laws can be found in the Appendices to Vol. 34, Papers and Reports.]

Dr. Charles Wardell Stiles moved a vote of thanks to the Committee on Constitution and By-Laws. This motion was seconded and carried unanimously.

FRIDAY, AUGUST 28TH.

Following the reading of papers on typhoid fever, Dr. H. W. Hill moved the appointment of a committee to consider the question of typhoid in every respect, but particularly to agitate in every manner the reporting of cases of typhoid fever, and directing their efforts to the municipality, the health officers and the individual physician.

This motion was referred to the Executive Committee.

[No action was taken by the Executive Committee. The

motion was afterwards referred to the Committee of Seven and approved, and the President instructed to appoint a committee. This has been done.—SECRETARY.]

Prof. Robinson presented the following resolution of thanks, which was adpoted by a rising vote:

Resolved, That the thanks of this Association be hereby extended, first, to the Local Committee of Arrangements. This has been one of the most successful meetings of the Association ever held, and its success has been in a great measure due to the untiring work of this committee. When the pleasures of these days are in the future recalled to our minds they will always be associated with the names of Dr. Simpson, E. M. Wood and Dr. Douglas, and those others who have worked with them. The lady members of that committee are, of course, included in this vote; but we wish to specially emphasize our appreciation of the services they have rendered to the ladies of our party.

Resolved, In the second place, that we extend our hearty thanks to the provincial government, the city council, to the parks board, to the trustees of the general hospital, to the press of the city, and to all other organizations and individuals who have contributed to our enjoyment and profit. Under this last head are included especially those who have put their automobiles at our service, and the general manager of this magnificent hotel—Mr. Wills. We, of course, go away leaving you little money to enlarge the material side of your city; but we leave you our respect and love, both because we cannot help it, and because we would not if we could.

The Secretary reported that Dr. Hill's resolution relative to publication of journal had been approved by the Executive Committee and recommended for adoption.

It was moved and seconded that the action of the Executive Committee be concurred in. [The President has ap-

pointed a committee to carry out the provisions of the above resolution.—SECRETARY.]

The Secretary reported that the Executive Committee had recommended for adoption the resolution of Dr. Hurty, providing for the publication of the report of the Committee on Ophthalmia Neonatorum, subject to the approval of the Publication Committee.

On motion the recommendation was adopted.

The Secretary reported that the Executive Committee had recommended for adoption the resolution offered by Dr. Hurty (in re-endorsing legislation intended to enlarge the scope and increase the efficiency of the Public Health and Marine Hospital Service).

On motion the resolution was adopted.

The Secretary announced that the Executive Committee is empowered under the new constitution to appoint the Committee of Seven. It has done so, and this committee consists of the three ex-officio members, President, retiring President and Secretary, and the following appointed members: Dr. William C. Woodward, of Washington, D. C.; Professor Franklin C. Robinson, of Brunswick, Maine; Dr. Henry Mitchell, of Asbury Park, New Jersey, and Dr. John N. Hurty, of Indianapolis, Ind.

Dr. John F. Anderson of Washington offered the following amendment to the constitution and by-laws:

In Chapter Four, strike out the word "fifteen" between the words "to" and "minutes," and insert in place thereof the word "twenty."

This amendment was referred to the next meeting of the Association.

Dr. Charles A. Hodgetts presented the report of the Advisory Council as follows:

The Advisory Council presents the following as its report: President, Dr. Gardner T. Swarts of Providence, R.I.; First Vice-President, Dr. R. M. Simpson, of Winnipeg, Manitoba;

Second Vice-President, Dr. Jesus Chico, of Mexico; Third Vice-President, Major Charles F. Mason, U. S. Army, Washington, D. C.; Treasurer, Dr. Frank W. Wright, of New Haven, Conn.; Secretary, Dr. Charles O. Probst, of Columbus, Ohio; three members of the Executive Committee, Mr. James O. Jordan, of Boston, Mass.; Dr. William A. Evans, of Chicago, Ill., and Dr. A. J. Douglas of Winnipeg, Manitoba.

The Advisory Council recommends that Richmond, Va., be chosen as the next place of meeting.

On motion the report was adopted as read.

The following officers were submitted by the various Sections to the Association, with the recommendation that they be confirmed, and on motion they were all duly elected:

SECTION OF MUNICIPAL HEALTH OFFICERS.

Chairman, Dr. William C. Woodward, of Washington, D. C.; Vice-Chairman, Dr. A. J. Douglas, Winnipeg, Manitoba; Secretary, Dr. E. C. Levy, of Richmond, Va.; Recorder, Dr. Charles V. Chapin, of Providence, R. I.; Council, Dr. S. H. Durgin, of Boston, Mass.; Dr. M. S. Iglesias, of Vera Cruz, Mexico; Dr. William A. Evans, of Chicago, Ill.; Dr. T. H. Baker, of Louisville, Ky., and Dr. James Roberts, of Hamilton, Ontario.

LABORATORY SECTION.

Chairman, Dr. J. J. Kinyoun, of Washington, D. C.; Vice-Chairman, Dr. William Royal Stokes, of Baltimore, Md.; Secretary, Mr. B. R. Rickards, of Boston, Mass.; Recorder, Dr. H. D. Pease, of Albany, N. Y.; Council, Dr. H. W. Hill, of Minneapolis, Minn.; Dr. Edward Bartow, of Urbana, Ill.; Dr. B. H. Stone, of Burlington, Vt.; Dr. D. G. Revell, of Edmonton, Alberta, and Dr. E. C. Levy, of Richmond, Va.

SECTION OF VITAL STATISTICS.

Chairman, Dr. Charles A. Hodgetts, of Toronto, Ontario; Vice-Chairman, Dr. William H. Guilfoy, of New York City; Secretary, Dr. W. R. Batt, of Harrisburg, Pa.; Council, above and Dr. Jesus Chico, of Mexico; Mr. A. Blue, Ottawa, Ontario; Dr. M. L. Price, of Baltimore, Md.; Dr. William C. Woodward, of Washington, D. C.; Dr. John N. Hurty, of Indianapolis, Ind.; Dr. Cressy L. Wilbur, Honorary and Advisory Member, of Washington, D. C.

Dr. Henry Mitchell presented the report of the committee on the establishment of a journal with the following resolution which had been recommended by the Executive Committee for adoption.

WHEREAS, It appears from the report of the Treasurer that the funds of this Association, now in hand, are insufficient to permit of the publication of all the transactions of the present meeting; therefore, be it

Resolved, That the Publication Committee is hereby authorized to expend the sum which is available, and which may be appropriated by the Committee of Seven for the publication and distribution of the proceedings of the Winnipeg meeting, in full or in abstract, in such form as the said Publication Committee may deem best.

On motion of Dr. Hill the resolution was adopted.

On motion of Dr. Hodgetts the report of the Committee was accepted and the members of the Committee thanked and discharged.

The President stated Dr. Kohnke, chairman of Committee on Relief of Family of James Carroll, would not be able to do the work, and that Dr. Kohnke had requested that another member be appointed in his place. The President suggested that the incoming President appoint such a member. On motion of Dr. Hodgetts the appointment of the member of the Committee was left to the incoming President.

There being no further business, the Association adjourned *sine die.*

C. O. PROBST, Secretary.

Attest.

The following papers, read at the meeting of the Laboratory Section at Winnipeg, were not received for publication: Experimental Leucocytosis in the Cow's Udder, by Conrad Hoffman; The Individual Animal as a Factor in the Germ Control of Milk Supplies, by E. G. Hastings and Conrad Hoffman; The Waters of the Great Lakes, by R. B. Dole; Some Studies of the Physiological Leucocyte Content of Cow's Milk, by B. H. Stone and L. P. Sprague (Journal of Medical Research, 1909); A Comparison of Practical Methods for Determining the Practical Content of Milk (Journal of Infectious Diseases, Vol. V, page 412), by P. G. Heinemann.

The following Association papers were withdrawn from publication:

Report of the Committee on Ophthalmia Neonatorum, Dr. F. Park Lewis, Chairman, Buffalo, N. Y. (published in full in the Journal of American Medical Association, March 13, 1909, Vol. 52, p. 876).

"Water Problems of the Middle West," Dr. F. F. Westbrook, Minneapolis, Minn.

"Control by Patent of Sewage Disposal Methods," F. Herbert Snow, Harrisburg, Pa.

"Hookworm Disease," Dr. Chas. Wardell Stiles, Washington, D. C.

"The Diagnosis and Prevention of Smallpox in Ontario," Dr. James Roberts, Hamilton, Ontario.

Laboratory Section

ROUTINE COUNTS OF BACTERIA IN WATER * SUPPLIES

By KARL F. KELLERMAN and H. A. WHITTAKER

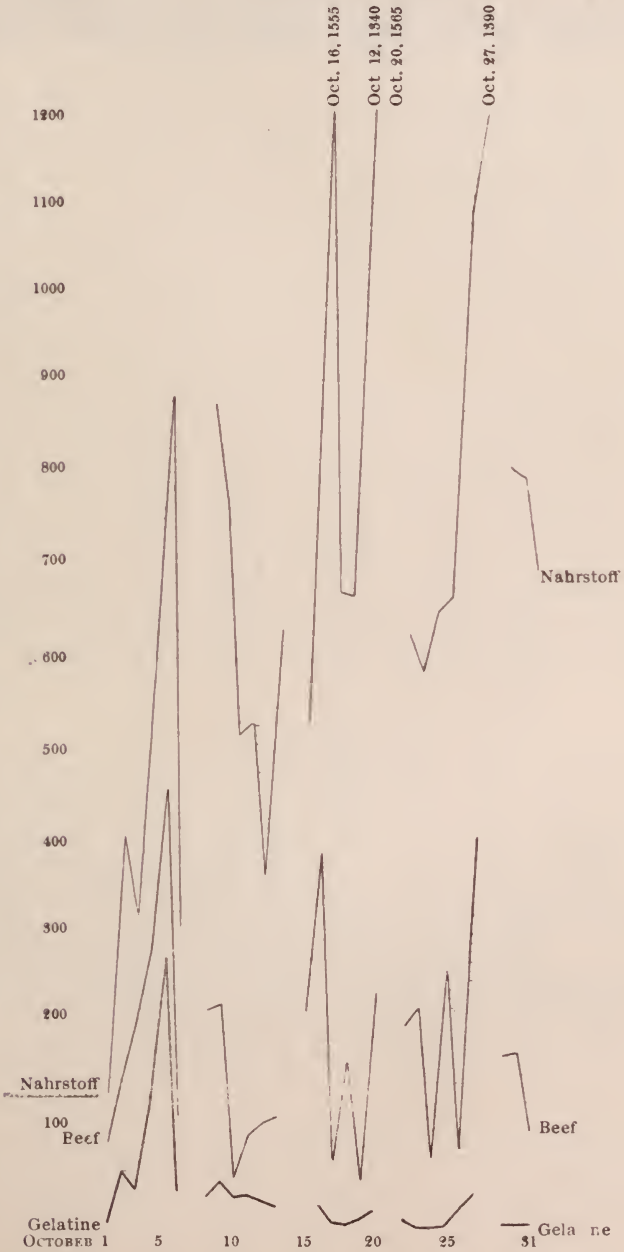
The routine bacteriological examination of a water supply must depend to a large extent upon the determination of the number of bacteria in a measured quantity of water. At best, this determination cannot be accurate, as the variety of the species in the water, the culture media employed for plating, the temperature of incubation, the time of incubation, and the skill of the manipulator, are all limiting factors of more or less importance. A long step toward securing comparable results was made when the Committee on Standard Methods of Water Analysis of the American Public Health Association issued their classic recommendations. Here, however, in accord with such authorities as Thresh, Mason, Horrocks, etc., gelatin is given the preference over agar as the standard medium. The low temperature of incubation and therefore delayed results with this medium are objectionable. In the words of Gage "it is essential that the procedures be so modified that they shall yield more complete information regarding the various kinds of water bacteria under examination, and that they shall yield that information within a reasonably short time."

Heartily subscribing to this sentiment and emphasizing the paramount importance of total counts, especially for the examination and control of filters, we believe that plain beef

*Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

(To face Page 534)

CHART SHOWING DIFFERENCE IN TOTAL COUNT OF BACTERIA IN WATER SUPPLIES DETERMINED UPON NAHRSTOFF AGAR, BEEF AGAR AND BEEF GELATIN



(To face Page 535)

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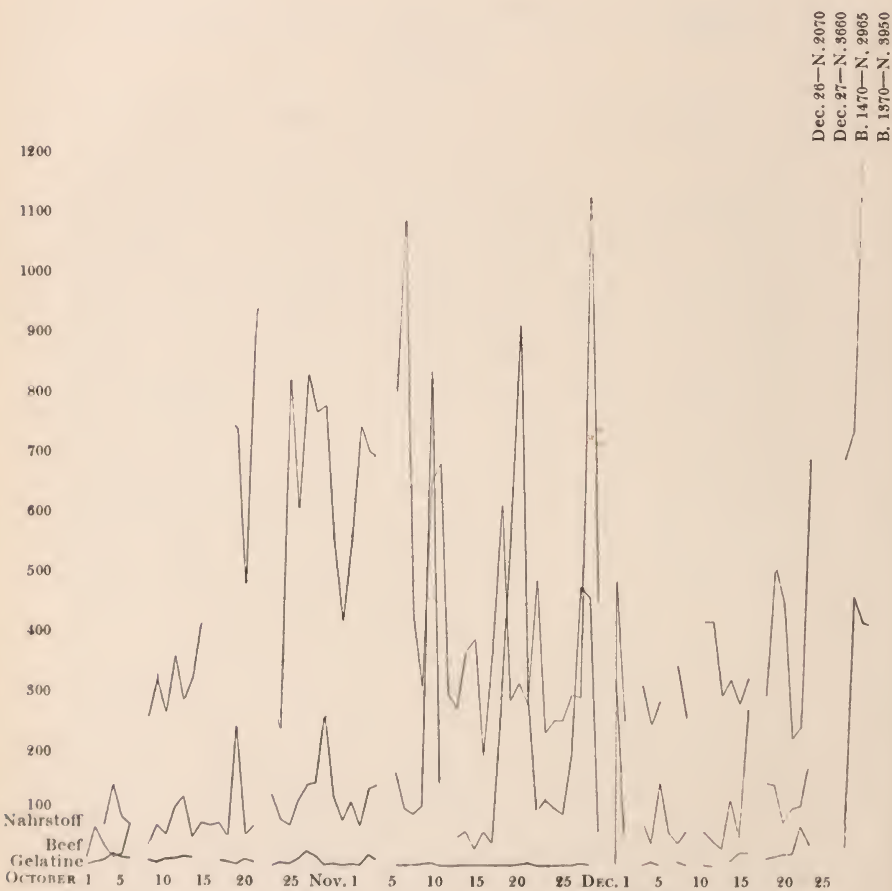

agar, made in accordance with the recommendations of the aforesaid Committee on Standard Methods of Water Analysis, is the most suitable medium for routine work, and that a temperature of from 28° to 30° C. is the best for incubation. At this temperature twenty-four hours gives a fairly high count, and forty-eight hours one considerably higher. Of course it is admitted that the terms "total counts of bacteria" are figures of speech—just as beef agar usually gives a higher count than beef gelatin, so does Nahrstoff agar (see Hess and Niedner) outcount beef agar; and other media might show still greater numbers.

The delay in securing results makes Nahrstoff undesirable, although there can be no doubt that as an indicator of conditions changing—and this is all we can expect of routine counts—it is much more sensitive than beef agar or beef gelatin. The accompanying curves show the results of comparative work over a considerable period, with different kinds of water. The lowest line is gelatin, according to the standard methods, the middle line is beef agar, forty-eight hours at 28-30°, and the top line Nahrstoff agar five days at 28-30°.

REFERENCES.

J. C. Thresh, The Examination of Waters and Water Supplies, p. 336, Philadelphia, Pa., 1904.

W. H. Horrocks, An Introduction to the Bacteriological Examination of Water, p. 10, London, 1901.

W. P. Mason, Examination of Water, p. 106, New York, 1899.

Stephen De M. Gage, On the Significance of the Numbers of Bacteria in Water and Sewage Developing at Different Temperatures. Report of State Board of Health of Massachusetts, 1906, pp. 327-349.

Dr. W. Hesse and Dr. Niedner, Die Quantitative Bestimuning von Bakterein in Fluesigkectin. Zeit fur Hygiene, Vol. 53, pp. 259-280, 1906.

DETERMINATION OF NITRATES BY REDUCTION WITH ALUMINUM*

By EDWARD BARTOW and JEROME STANLEY ROGERS

The work described in this paper was begun with the intention of making a comparison of various methods for the determination of nitrogen as nitrates; but after a few preliminary tests and also because we noted that E. M. Chamot of Cornell University had prepared a paper on the phenol sulphonic acid method, it was determined to confine the experiments almost entirely to a study of the method which depends upon the reduction of nitrates by means of aluminium.

The first series of the preliminary tests were made on a series of ten waters chosen from the routine samples of the State Water Survey Laboratory. These, according to the analysis made by the method in use in the laboratory, contained nitrogen as nitrates in varying amounts from 0.00 to 72.0 parts per million. These ten waters were then analyzed for nitrogen as nitrates by the aluminium reduction method, by the phenol sulphonic acid method and by the Brucine method of Noll.

An examination of the results showed that the amount of nitrogen found by the various methods was not the same. The Brucine method gave the lowest results and the phenol sulphonic acid method the highest. Especially was this true of the samples containing the larger amounts.

Since we could not be certain which method gave the

*Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

correct results when waters containing unknown quantities of nitrogen as nitrates were used, the second series of preliminary tests was run on ten samples of water containing known quantities of nitrogen as nitrates in amounts varying from .05 to 50.0 parts per million. Duplicate analyses were made by the phenol sulphonic method* and triplicate analyses by both the Brucine and aluminium reduction methods. The aluminium reduction method gave high results in the tests of samples which contained less than .5 parts per million and low results in all tests in which one or more parts per million was present. In these latter results there was a recovery of only 80 to 90% of the nitrogen placed in the sample. The phenol sulphonic acid method gave high results in most of the determinations. A few of the determinations, however, were low. The check analyses differed considerably from each other. The Brucine sulphuric acid method in the majority of the tests gave low results. This was especially true of the samples containing the larger quantities of nitrogen as nitrates. These results as a rule were lower even than those obtained by the aluminium reduction method. We did not feel that the results we obtained by any of the methods were entirely satisfactory.

Since Professor E. M. Chamot of Cornell was investigating the phenol sulphonic acid method, and since the aluminium reduction method has been in use in this laboratory almost exclusively since the organization of the Survey, it was decided to determine, if possible, the cause of the high results in the samples containing low nitrogen and the low results in the samples containing the larger quantities.

The best discussion of this aluminium reduction is that of Hazen and Clark, and our results are in many respects in accord with theirs, though differing in some features.

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*Standard Methods of Water Analysis, p. 40.

† Chem. News, LXIV, 162.

Experiments were planned with a view to determining the effect of temperature upon the reduction, and of time on the completeness of the reaction. A solution containing 10 parts per million of nitrogen as nitrates was prepared. To portions of 100 c.c. each of this solution was added two c.c. of a 40 per cent. solution of sodium hydroxide, free from nitrates. The solution was concentrated to 15 to 20 c.c., the residue was washed into a test tube holding approximately 100 c.c. and was then diluted to about 75 c.c. with nitrate free water and a strip of aluminium added. Eight of these samples were allowed to stand at room temperature; eight in the incubator at about 37½°, and eight in the ice box at a temperature of from 5 to 8° C. At the end of sixteen hours half of the samples were diluted with 250 c.c. of distilled water, and the ammonia formed was distilled over and determined. The remainder of the samples were treated in the same way at the end of thirty-two hours. We noted that the longer the solutions were allowed to stand the less nitrogen as nitrates was recovered. We noted also that the largest amount of nitrogen was recovered when the reduction took place at the temperature of the ice box, and the smallest amount of nitrogen at a temperature of from 35 to 40° C. This agrees as far as temperature is concerned with the results obtained by Hazen and Clark.

Two of the solutions were nesslerized directly after dilution to 200 c.c., and the results agreed so closely with results obtained by distillation that in subsequent tests on standard solutions we estimated the nitrogen by direct nesslerization.

The low nitrogen would hardly be accounted for by a failure to reduce all the nitrates present as the results were lower when the solutions were kept the longer. We therefore next sought to determine the amount of nitrogen which was probably carried off as ammonia gas.

A series of experiments was planned in which four solu-

tions were run at room temperature; four at the temperature of the incubator, 37½°; and four in the ice box at the temperature of from 5 to 10° C. 100 c.c. of the standard solution containing 10 parts per million of nitrogen as nitrate were used in each case. Each solution was prepared as in the preceding experiment, and in addition the mouth of the test tube was closed with a rubber cork, through which passed a U-shaped glass tube of such a length that the outlet could be placed in a second test tube containing a small amount of dilute hydrochloric acid which served as a trap to catch any ammonia that might escape. The traps were changed at the end of each hour for six hours, and the ammonia caught in the traps was determined by direct nesslerization. Very little ammonia passed off. The average for the samples at the temperature in the ice box was .01 parts per million; for the samples at room temperature the average was .09 parts per million; and for the samples at 37½° the average was .21 parts per million. The amount found in the traps in no way agreed with the amount not recovered in the previous experiments.

The ammonia was determined in the reduction tube after a total period of 20 hours. At room temperature the average for the four solutions was 9.6. At the temperature of 37½° the average was 10.0. At the temperature of the ice box the average was 9.4. If to this we add the ammonia found in the traps the total amount recovered is slightly more than 10 parts per million. The excess was practically equal to the test of our distilled water and reagents. We were surprised at the results of this experiment, for we expected to find considerable ammonia in the traps, whereas practically none was found. We feel that this fact can be explained on the supposition that ammonia is carried out of the solution by the hydrogen evolved. When no traps are used the light gases diffuse quickly, whereas when the trap is used diffusion is slow. The more soluble ammonia

is re-dissolved by the liquid while the hydrogen alone passes out through the trap. The results indicate that the temperature at which the reduction takes place is of little importance provided care is taken to prevent diffusion of the light gases.

We next carried out a series of experiments to compare directly the results of reduction with and without traps and to confirm the results of the two preceding series. The same standard solution was used and the tests were made the same as before. With traps, at room temperature, 9.8 parts per million of nitrogen as nitrates was recovered from the reduction tube and 0.09 from the trap, making a total recovery of 9.89 parts per million, whereas when the traps were not used only 6.0 parts per million were recovered.

With traps, at a temperature of 37½°, 10 parts per million were recovered from the reduction tube and .14 from the traps, whereas when the traps were not used only 4.6 parts per million were recovered.

With traps, at the temperature of the ice box, 10 parts per million were recovered from the reduction tube and .06 parts per million from the traps, whereas from the tubes without traps only 8.2 parts per million were recovered. These results confirmed our former conclusions.

One of the objections to the aluminium reduction method lies in the fact that considerable time is required for the completion of the reaction. It has been customary to allow the reduction to go on over night. We arranged tests to determine the time at which the reaction would be completed. We first planned five series of four tests each, in which the reduction would run for periods of 2, 4, 6, 8 and 10 hours at room temperature. We used a solution of the same strength as before, containing 10 parts per million of nitrogen as nitrates. Traps were used during the reduction and the ammonia formed was determined by direct nesslerization. At the end of two hours 7.7 parts per million of nitro-

gen were recovered from the solution tubes and .02 parts per million from the traps. At the end of four hours the reduction was evidently complete as 10.1 parts per million of nitrogen as ammonia was recovered from the solution tubes and .06 parts per million from the traps. The tests which ran 6, 8 and 10 hours gave practically the same results as the four-hour test. At the end of two hours nitrites amounting to .02 parts per million were found.

Since at room temperature the reduction was completed in less than four hours, in the next series of tests, at a temperature of $37\frac{1}{2}°$, it was arranged to test groups of samples of four each at the end of 1, 2, 3 and 4 hours. These tests were carried out in the same manner as the tests made at room temperature. At the end of one hour 4.6 parts per million of nitrogen were recovered from the solution tube and .01 parts per million from the traps. At the end of two hours 8.9 parts per million were recovered from the solution tubes and .03 parts per million from the traps. At the end of three hours 10.3 parts per million were recovered from the solution tubes and .03 parts per million from the traps.

There was a slight increase in the amount of nitrogen recovered at the end of the fourth hour. These tests indicate that the time required for solutions containing nitrates alone need not be as long as has been previously recommended.

Tests were next run with waters containing smaller amounts of nitrogen, namely, 0.5 and 2.5 parts per million. The tests were run by direct nesslerization at room temperature for four hours, using traps. The distilled water used contained .21 parts per million of nitrogen as nitrates which, after deduction from the amount of nitrogen recovered by the determination, gives .35 parts per million instead of .5 parts per million, and 2.34 parts per million instead of 2.5 parts per million.

A series of six determinations was run on waters which

had been analyzed by the regular routine of the laboratory. The determinations were made by direct nesslerization at room temperature after four hours' reduction, using traps. In each case a larger amount of nitrogen was recovered.

In No. I. 0.44 parts per million instead of .12 parts per million.

In No. II. 42.00 parts per million instead of 30.00 parts per million.

In No. III. 0.44 parts per million instead of .32 parts per million.

In No. IV. 30.00 parts per million instead of 25.00 parts per million.

In No. V. 6.8 parts per million instead of 4.20 parts per million.

In No. VI. 3.2 parts per million instead of 1.6 parts per million.

A series of analyses in which the amount of nitrogen was unknown to the analyst was next made at room temperature. The period of reduction was four hours, traps were used and the ammonia found was determined by direct nesslerization.

	Amount of nitrogen added.	Amount of nitrogen found.
I.	22 parts per million	24 parts per million
II.	10 parts per million	10.8 parts per million
III.	2 parts per million	2.8 parts per million
IV.	0 parts per million	.16 parts per million
V.	.28 parts per million	.4 parts per million

The foregoing series of experiments would indicate that nitrogen as nitrates should be recovered with a reasonable degree of accuracy from pure water to which nitrogen as nitrates had been added and from ordinary drinking water.

Since the phenol sulphonic acid method is said to be unsatisfactory for the determination of nitrogen as nitrates in sewages, it was decided to run a series of tests on sewages to which nitrogen as nitrates had been added. It is well

known that nitrates in sewages are very low. We made determinations of nitrogen as nitrates before and after the addition of 10 parts per million to each of three samples of sewage. These were the sewage of Urbana before and after it passed through the disposal works and the water from a polluted stream which passes through the University grounds.

In the first series of tests the analysis was made 24 hours after the nitrates were added. We recovered no more nitrogen as nitrates from the samples of sewage to which 10 parts per million had been added than from the original sewages. The ten parts per million of nitrogen as nitrates had entirely disappeared. The water from the polluted stream contained originally one part per million of nitrogen as nitrates. From the sample to which 10 parts per million had been added only 8 parts per million were recovered at the end of the four hours reduction period.

In order to check the results the work was repeated with similar results.

A series of analyses was then run immediately after the nitrates were added. Proceeding in this way 7.7 parts per million of nitrogen as nitrates were recovered from the raw sewage, to which 10 parts per million of nitrogen as nitrates had been added; 9.4 parts per million were recovered from the sewage which had passed through the disposal works; 8.7 parts per million were recovered from the polluted stream. Nitrites were found in all of the samples after four hours' reduction, indicating that the reduction was not yet complete. We conclude from this series of tests that in the presence of organic matter the reduction of nitrogen to ammonia is slower than when the organic matter is absent. We conclude also that it would be useless to make the determination of nitrogen as nitrates in raw sewage, and also in sewage which has passed through a solution chamber similar to the one at Urbana.

GENERAL SUMMARY.

1. Because of loss of ammonia the amount of ammonia recovered in a given time in open reduction tubes varies inversely with the temperature.

2. The loss of ammonia is prevented and the temperature has no effect if the hydrogen is allowed to escape through traps.

3. The reduction is completed in less than four hours in pure water or waters of average purity; in highly polluted waters the reduction requires longer time.

4. In sewage the determination of nitrogen as nitrates is practically without value because the nitrates are reduced by the oxidation of the organic matter present.

A STUDY OF CERTAIN PARACOLON FORMS FOUND IN POLLUTED DEEP WELLS*

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About August 1st, 1907, a new wing of the State Hospital for the insane at Trenton, New Jersey, was first put in service. The sewer from this wing was laid in a trench through red sandstone and shale and passed within fifty feet, horizontally, of the three deep wells which furnished the water supply of the hospital. These wells were approximately 260 feet deep, with iron casings extending down a foot into the hard rock. Wells thus constructed would ordinarily be regarded as being safe from pollution.

On account of a typhoid fever epidemic which had visited the hospital earlier in the summer, the only other available water supply, an open and polluted spring, had been cut off from the system and bacterial analyses of the well waters as they reached the buildings were frequently made. Twenty analyses of these waters made during the period, August 1st to August 17th, showed the absence of fermenting organisms, ten cubic centimeter quantities having been tested. *B. coli* was isolated from one ten cubic centimeter sample on August 17; from a one cubic centimeter sample on the 19th, and from three such samples on the 22nd. Thereafter it occurred in increasingly greater numbers.

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Studies were made of the individual wells and *B. coli* were found regularly in 0.1 cubic centimeter in the water of that well nearest the new sewer, and in lesser numbers in the others.

Suspicion was naturally directed to that sewer. An investigation showed it to be poorly laid and in a leaky condition. Its use was discontinued on September 19th, and large quantities of bleaching powder were introduced with a stream of water. It was hoped by disinfecting the neighboring soil to repair some of the damage that had been done. A rather unusual opportunity was here offered for study. The wells were known to have been unpolluted up to August 1st, and polluted with sewage from August 1st to September 20th. After that time no new pollution was possible, the use of the sewer having been discontinued. These conditions were of so unique a character that occasion was taken to make a special study of the bacteria found in the waters and of the various methods employed for detecting pollution. Daily samples from each of the three wells were examined. Each sample was inoculated into dextrose broth, lactose bile and dextrose neutral red broth. The first medium was prepared according to the standard methods adopted by this section, the second according to Jackson's directions, and the third was like the first with the addition of neutral red.

RESULTS OF PRELIMINARY FERMENTATIONS:

For reasons which later appear the period covered by this detailed study will be divided into two periods of approximately thirty days each. The first from September 10 to October 12; the second from the latter date to November 9. During this entire period the results obtained on the dextrose neutral red broth were practically identical with those obtained on the standard dextrose broth. The former will not be considered further.

The results of the preliminary tests are tabulated below in the two periods mentioned and in a third period covering the entire time.

TABLE I

Results of Preliminary Fermentations and Isolation of B. Coli and Paracolon

Period	Volume ested c. c.	Total	Number of tests Giving Gas in			Number of Times B. coli found in				Number of Times Paracolon found in				Number of Times Colon Forms found in			
			A	B	C												
			Dextrose only	Dextrose and Bile	Bile only	A	B	C	Total	A	B	C	Total	A	B	C	Total
Sept. 10 to Oct. 12	10	109	21	56	3	2	43	3	48	14	11	0	25	16	54	3	73
	1	90	14	22	0	0	19	0	19	10	5	0	15	10	24	0	34
	Total	199	35	78	3	2	62	3	67	24	16	0	40	26	78	3	107
Oct. 12 to Nov. 9	10	88	34	14	3	0	7	1	8	30	9	2	41	30	16	3	49
	1	88	12	5	0	2	2	0	4	9	2	0	11	11	4	0	15
	Total	176	46	19	3	2	9	1	12	39	11	2	52	41	20	3	64
Sept. 10 to Nov. 9	10	197	55	70	6	2	50	4	56	44	20	2	66	46	70	6	122
	1	178	26	27	0	2	21	0	23	19	7	0	26	21	28	0	49
	Total	375	81	97	6	4	71	4	79	63	27	2	92	67	98	6	171

Note. – Dextrose results are recorded positive when gas appears within 48 hours, bile when 20% or more gas appears within 72 hours.

In this table, under column headed A, will be found results obtained on dextrose broth only, the corresponding bile test having been negative. Similarly under C the result was positive on bile and negative on dextrose. Under B are recorded results positive on both media. The division referring to *B. coli* includes those organisms which conform strictly to the tests laid down in the standard methods adopted by this section. The division referring to paracolon includes a group of forms which also conform strictly to those tests. The difference lies in the behavior of the two groups toward lactose. The former gives gas in lactose; the latter do not. It should be called to mind that gas formation in lactose broth is not an essential characteristic in the present standard method for the identification of B. coli. The third division includes both the groups and gives therefore the actual *B. coli* as at present defined.

Referring first to this third division, and taking the total period as given in the last line, we find that dextrose was fermented alone in 81 cases, and together with the parallel bile test in 97 cases,—a total of 178 times. Similarly bile was fermented 97, plus 6, or 103 times. Colon forms were isolated altogether in 171 cases. There were 178 positive preliminary tests in dextrose and 103 in bile, an apparent advantage in favor of the dextrose broth as a presumptive test. This advantage is seen to be still more striking if we consider only the 1 c.c. samples of this same period. Colon forms were isolated altogether 49 times. There were 53 positive preliminary tests in dextrose and only 27 in bile. Taking the period, October 12 to November 9, of all the samples tested, 65 fermented dextrose, 22 fermented bile, and 64 gave colon forms. In the same period of the 1 c.c. samples, 17 fermented dextrose, 5 fermented bile, and 15 gave colon forms. To better point out this rather unusual result these figures are tabulated by themselves, avoiding

the confusion of the larger table, the total colon forms being given in the last column.

TABLE II.

Relation of preliminary fermentation tests on dextrose broth and lactose bile to the final isolation of colon forms

Period	Volume tested c.c.	Number of Positive Fermentations in		Number of Positive Tests for		
		Dextrose	Bile	B. Coli	Para Colon	Colon Forms
Sept. 10 to	10	77	59	48	25	73
Oct. 12	1	36	22	19	15	34
	Total	113	81	67	40	107
Oct. 12 to	10	48	17	8	41	49
Nov. 9	1	17	5	4	11	15
	Total	65	22	12	52	64
Sept. 10 to	10	125	76	56	66	122
Nov. 9	1	53	27	23	26	49
	Total	178	103	79	92	171

Earlier in this work the fact was noted that the dextrose broth was giving much higher results in preliminary tests than the bile. This was to be expected, but it soon appeared that the dextrose results were in very close agreement with the final complete results, while the bile was very low as has been indicated. It was noted at the same time that the organisms fermenting the bile always gave strong red colonies on litmus lactose agar, while those fermenting dextrose frequently gave colonies which were red but not so strongly acid. At the beginning of the period covered by the above table, therefore, all cultures from dextrose fermentations were fished into ordinary lactose broth and into dextrose bile. As had been anticipated, those cultures which gave feeble acid production did not give gas in the lactose broth, but did ferment dextrose bile vigorously. Apparently there was present in these waters a distinct strain of organism which agrees with *B. coli* as ordinarily understood. It forms acid, but little or no gas in lactose. From that time on, then, these two types were distinguished. Tables I and II show the reason for the poor bile results. A large proportion of

these are typical forms, which, for want of a better name, are here called *paracolon,* were being dealt with. They did not ferment lactose and hence were lost by the lactose bile medium. It is interesting to note that the bile itself had no inhibiting effect upon them whatever in the dextrose bile medium.

An interesting point also is the relative abundance of the two types. To bring out the point the time has been divided into two periods in the tables. During the first period pollution was at a maximum, and during the second it was slowly disappearing. In the one case the lactose fermenting *coli* outnumbered the *paracoli* in a ratio of 1.7 to 1.0. In the other the ratio was over 4 to 1 in the other direction. That is to say, during the gradual improvement of the well waters the typical *coli* decreased at a much more rapid rate than did the *paracoli.* Toward the end of the study *paracoli* persisted for a considerable period after the typical forms had disappeared.

STUDY OF THE PARACOLON FORMS:

It was deemed highly desirable to obtain as complete knowledge as possible of this important group of organisms. Accordingly special studies were made upon it during this investigation.

Records were kept of the appearance of each litmus lactose agar plate from which colonies were fished. The amount of acid produced by the organism could be roughly indicated by the color given to the plates, recorded as red, pink, or no change. A total of 198 *paracolon* colonies were fished from an equal number of plates. The recorded color of these plates is given in the following table, divided as usual into two periods. During the same period 160 colonies were fished which proved to be typical *B. coli.* The recorded color of these plates was red in all cases.

A distinct change in the acid producing powers of these organisms is noticeable in this table. This seems to be directly associated with the more rapid decrease of the acid forming *coli* alluded to above. The tendency in both cases is to eliminate most rapidly those forms which most readily acidify lactose.

TABLE III.

Acidity produced by Paracolon as indicated by change of color in Litmus Lactose Agar

Period	Number of plates.			
	Total	Turning Red %	Turning Pink %	No change %
Sept. 10 to Oct. 12	104	29.8	52.8	17.3
Oct. 12 to Nov. 9	94	19.1	61.7	19.1

The evidence seems to be very definite here that those forms which have lived longest in the soil, or are farthest away from the initial sources of pollution are least able to ferment lactose. They produce acid less vigorously than the normal forms and form little or no gas. As to whether these forms represent degenerate individuals or constitute a distinct and more resistent strain remains to be shown.

Fifty strains were selected at random from the daily plates and subjected to a detailed study. They were first inoculated with lactose broth and dextrose bile media. Very feeble gas production was noted in lactose broth in a few cases. As a rule there was none. Dextrose bile was fermented vigorously, showing as has already been pointed out, that these forms are not excluded by the bile. After being on artificial media for a few weeks 70% of these cultures developed lactose-fermenting powers. This, however, was never vigorous as in normal *coli*. Their action upon saccharose was also tested. About half of them formed gas in that sugar. Or

the basis of their fermentations of lactose and saccharose the fifty strains were divided into four groups and further studies were made upon them. It became apparent that these four groups possessed several correlated properties in increasing or decreasing magnitudes, and further, that the whole division considered in respect to these characteristics lay intermediate between typical *B. coli* and *B. cloacae.* For the purpose of comparison 19 strains of *B. cloacae* were isolated from the same waters, the organism being quite abundant at that time. In the following table are shown the four groups of *paracoli,* selected in reference to their sugar fermenting powers, with a column of *B. coli* on one side and *B. cloacae* on the other. Numbers refer to per cent. of positive tests. Obviously no statistical value attaches to these results obtained on so few numbers, but the intermediate character of the group as a whole and a decided correlation of certain characteristics is distinctly indicated.

TABLE IV

Table showing the intermediate position of the four paracolon groups between *B. coli* and *B cloacae* and correlation between certain characteristics

Test	Per cent of Total Giving Positive Tests.					
	B.coli	Paracolon groups				B. Cloacae
		1	2	3	4	
Fermenting Dextrose	100	100	100	100	100	100
Fermenting Lactose	100	100	100	0	0	16
Fermenting Saccharose	?	0	100	0	100	100
Lactose strongly acid	100	67	44	29	20	0
Gelatin liquefied	0	0	14	14	60	100

In general these organisms would pass the ordinary tests for *B. coli,* and in fact they were selected on the basis of the standard tests for that organism. The liquefaction of gelatin noted occurred always between 14 and 28 days. Forms which liquefied more rapidly were classed as *B. cloacae.* The

distinction is obviously an arbitrary one, but was maintained according to present practice. On gelatin the growth was less luxuriant than usual, at times translucent. In milk acid production was less than normal. Coagulation generally occurred only after heating. Nitrate was reduced vigorously and indol produced rather weakly.

The gradual increase in the relative numbers of these atypical forms has been alluded to, as has the fact that they became relatively less active in acidifying lactose. It can be stated further that in all their characteristics they showed a definite progressive change during the period of the investigation. At first they were quite overlooked. Attention having been called to them through the low bile results they were later searched for, and identified on various platings by their slightly feebler powers of acid production in lactose. Identification at this time was quite difficult. Later, plates with pink colonies occurred more frequently. At the close of the study many plates were obtained in which no red colonies were found.

Upon fishing colonies which appeared to be otherwise typical, however, this organism was regularly isolated. The intermediate and gradually progressive characters of this organism appear to us to be of great significance.

In this same connection also, but possibly entirely independent of it, it should be stated that the appearance of *B. cloacae* was more frequent towards the end of the work and that after all other sewage species had practically disappeared, forms of proteus were frequently found.

Thus the change in characters from non-liquefying, lactose fermenting coli to liquefying non-lactose fermenting proteus was continuous and complete.

CONCLUSIONS.

We believe the results of this investigation have a greater importance than their mere scientific interest. According

to accepted standards of interpretation the pollution of these wells ceased with the disappearance of typical *B. coli.* But long after that point was reached other types presisted which were connected with the typical forms by a gradual and perfect transition. The arbitrary character of our accepted standards, necessary as it is in practice, appears to disadvantage in a case like the present one. For certain classes of work, such as the quantitative study of polluted rivers, the control of filtration processes, and legal work, a hard and fast definition of *B. coli* is needed. When we expect to find pollution we may measure it in this way better than in any other . *On the other hand, where it is desired to detect pollution, if any exists, however slight, where the least indication of pollution at present may mean serious consequences in the future; the most sensitive tests we have and the broadest possible interpretations are desirable.* In the present instance the source of pollution was known and had been dealt with. The actual amount of pollution was not serious. In fact, by excluding the one well and avoiding extra heavy drafts in the other two, and by discontinuing pumping entirely after rainstorms, this anxious period was safely tided over. But if the source of pollution had been unknown and the continued use of the water had depended upon the bacteriologist's report, great harm might have been done by a too rigid adherence to the accepted definition.

One further point of immediate importance is this: The standard methods adopted by this section allow the use of either dextrose or lactose in preliminary tests. In the confirmatory tests, however, the production of gas in lactose broth is not made an essential feature. This inconsistency should be remedied. In the present case two independent workers, both following conscientiously the present standard methods, would have come to opposite conclusions regarding the presence of *B. coli,* in 50% of the samples tested had one worked with dextrose and the other with lactose broth. Either

the definition of *B. coli* should be made to include fermentation with gas production in lactose broth, or the latter should not be used in preliminary tests. Lactose was introduced in place of dextrose, which was long the standard, to cut out certain organisms such as cloacae. The process of cutting out seems to be too severe, and in our opinion, where the fullest possible knowledge of conditions is desired, the use of dextrose broth in preliminary tests is to be recommended. For presumptive and comparative tests in such routine work, as the systematic control of filters or the regular examination of water supplies, lactose may still find useful application.

Since the original communication additional attention has been given to the organisms referred to as paracolon forms.

In a fairly large series of fecal examinations comprising about 100 examinations, made at the New Jersey State Hospital in connection with typhoid bacillus carriers, the occurrence of organisms answering to the description given above has been particularly searched for. That these are undoubtedly fecal in origin is shown by the fact that there was scarcely an examination in which forms could not be found which corresponded exactly to the various characteristics of the paracoli found in the water examinations if properly searched for. On the Drigalski-Conradi medium used in the series the initial colonies at times somewhat resembled those of the *B. typhosus*, while others would simply be regarded as a typical colon colonies unless further investigated.

It is doubtless this indefinite character of the initial growth of these organisms on lactose media even when grown directly from feces which has led largely to their neglect as indicators of fecal pollution in the interpretation of results of bacteriological water analysis.

AESCULIN BILE SALT MEDIA FOR WATER ANALYSIS*

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The considerable diversity of "presumptive" tests used in England and America for *B. coli* and other excretal organisms renders an apology almost necessary when introducing yet another test to the attention of laboratory workers. Such a presumptive test (and by this term we mean a simple test which will indicate in the majority of cases whether a water contains excretal organisms or not) largely used in American laboratories is the production of gas in a fermentation tube containing dextrose broth, with a gas formula of $H:CO_2=2:1$.

In English laboratories the bile salt broth of McConkey and Hill[1] or the modification of this medium with Neutral Red as suggested by Grünbaum & Hume[2] is more commonly employed. Phenol broth, lactose litmus agar, and other media have also been used by various workers.

Several investigators[3] have pointed out the limitations of these tests; thus in the case of the fermentation of dextrose,—that the amount of gas, and the percentage of CO_2 are subject to variation, even with pure cultures of *B. coli*, and that *B. coli* is frequently present in fermentation tubes in which the amount of gas was less than 10 per cent. after 48 hours' incubation at 37° C.

Irons[4] in an investigation comparing the results obtained with the dextrose fermentation tube and with neutral red

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broth found in 285 determinations 35 per cent. of positive results with the neutral red method. Prescott and Winslow[5] in a paper on the relative value of dextrose broth, phenol broth and lactose bile as enrichment media for the isolation of *B. coli* examined 176 samples of water from various sources. From the data they obtained they considered the bile medium inferior to dextrose broth as an enrichment medium in the process for the complete isolation of *B. coli*, but as a *presumptive* test, when the full working out of *B. coli* was impossible, the bile medium offered distinct advantages. Thus they sum up their experimental facts as follows:

"If the proportion of cases in which *B. coli* was actually isolated (70 out of these 176 samples) be taken as 100, the percentage of complete, positive results, using bile for preliminary enrichment was 91. If the dextrose broth fermentation test alone had been considered positive 120 "presumptive" tests would have been obtained, or 171 per cent. of the real number. On the other hand, the positive presumptive tests in bile, considering all gas formation as positive, would have given 78 positive results, or 111 per cent., only slightly in excess of the true value. As a presumptive test, the lactose-bile medium seems to yield a fair approximation to the truth, being far superior in this respect to dextrose broth.

Savage[6] strongly recommends the use of neutral red bile salt broth, the bile salt checking the growth of organisms other than *B. coli,* and the reduction changes in the neutral red serving as an indicating agent.

In the examination of water for *B. coli* none of these "presumptive" tests are reliable[7] in themselves, either to indicate that a water is good or bad, or that it contains or is free from *B. coli.* These preliminary tests have a great value in that they *indicate* the *probable* numerical presence of *B. coli,* and so save the labor of plating *all* the different dilu-

tions made. That is their object, and as such they are of extreme value, but they are not sufficiently reliable to take the place of the isolation and numerical determination of *B. coli* itself." The American Standard Committee come to similar conclusions.

The experience of the investigators mentioned above have been fully borne out by our own. During the last few years one of us has had occasion to analyse several hundred samples of water from many sources, the enrichment medium usually employed being dextrose broth in fermentation tubes. Latterly, however, the neutral red bile salt medium has been used with fairly satisfactory results.

Recently, we have had occasion to make a large number of analyses of the Ottawa River water, and as *B. coli* or its varieties was constantly present in amounts of 5 c. c. or less, it was necessary to find out the exact number of this organism, and for this purpose we employed the neutral-red-bile-salt-lactose agar of Grünbaum & Hume. The counting and isolation of *B. coli* from this medium gave us fair results, but even with considerable practice, we were at times unable to determine from the appearance of the colony whether it was that of *B. coli* or some other organism which produced red colonies with the surrounding medium red; and on this account we determined to use aesculin instead of neutral red.

Aesculin is a glucoside and undergoes a hydrolitic fermentation when *B. coli* and some other organisms are grown in a medium containing this sugar. The reaction, as nearly as one can express by this means a bacterial reaction, is probably as follows:

$$C_{15}\ H_{16}\ O_9 + H_2O = C_6\ H_{12}\ O_6 + C_9\ H_6\ O_4$$

Aesculin + water = Sugar + Aesculetin

The aesculetin then combines with the iron salt (Iron citrate) used in the medium to form a dark brown salt.

The reaction only takes place in sugar free media. Col-

onies of *B. coli* in media containing aesculin, are black with a black halo around them, and they are thus very easily seen, and can be readily counted against a white background.

It is true that other organisms besides *B. coli* give the reaction, notably *B. lactis aerogenes*, lactose fermenting yeasts, and some moulds, but the last two may be disregarded, as they are seldom found in water, and the appearance of their colonies is characteristic. *B. lactis aerogenes* may be regarded as an excretal form, and hence it is of some benefit to be able to recognize its presence, and with very little practice the appearance of the colonies of this organism on the aesculin medium may be readily noted, as the colonies are larger, moister, and more raised than those of *B. coli.* Some forty species or varieties* of bacteria and yeasts have been grown in media containing aesculin with negative results.

The preparation of aesculin media is easy, and different lots are very uniform in composition. Our usual method of preparing is to first weigh out,—

1 or 2 per cent. Witte's peptone,
.5 " " sodium taurocholate (commercial),
.1 " " aesculin,
.05 " iron citrate,
100 c. c. Tap-water.

After steaming from 15 to 30 minutes the medium is filtered and filled into test tubes. For aesculin agar 1.5 per cent. of agar is used, and after dissolving the agar in part of the water the remaining ingredients are added, brought to the boil and then filtered, or else the medium is cooled for the addition of white of egg or albumen, again brought to the boil, and then filtered and tubed.

*B. fluorescens; B. fluor. liquefaciens; B. prodigiosus; B. lactis viscosus; Slimy milk bacteria, 3 species; B. butyricus; B. Zopfii; Proteus vulgaris; B. mesentericus; B. mycoides; 5 species lactic acid bacteria; B. cloacae, one culture from Jordan and one from Johns Hopkins University; etc., etc.

The tubes may be either sterilized in the steam sterilizer on three successive days, or autoclaved for 15 minutes at 15 lbs. pressure.

We advise using bile-salt-aesculin-broth and aesculin agar for the routine examination of water, as the former acts as an enrichment method, and the latter indicates the number of colonies of *B. coli* present per c. c. in the small quantities of water used in pouring the plates. The method usually employed is as follows: We add 1 and 5 c. c. of water to two test tubes of aesculin bile salt broth, and place in sterilized Petri dishes one, two, three or five cubic centimetres of water, respectively, and then pour into each plate melted aesculin bile salt agar, from 8 to 16 c. c., depending on the amount of water used. After using sufficient of the sample for other plates, 10 c. c. of four times strength aesculin bile broth is added to the sample bottle, and all tubes, plates, etc., are incubated at 37.5°-40°C. For waters in which the colon bacillus is present in quantities of 5 c. c. or less, the aesculin bile salt agar gives very reliable results. If black colonies are present on the plates, they may be subcultured in 24 hours, and even the presence of the black colony furnishes presumptive evidence, as in the analysis of more than 60 samples of surface waters we have invariably found that the black colony on being subcultured presented all the features of an "excretal *B. coli*" or *B. lactis aerogenes*. When using aesculin bile salt broth, if a positive reaction takes place the medium turns black, and we consider this reaction a better presumptive test for *B. coli* than the red colonies in neutral red bile salt lactose agar, or gas and acid in dextrose broth, as from the result of 60 tests in which we obtained a black coloration in aesculin bile salt broth, we secured the same number of (60) positive tests of *B. coli.*

The disadvantages of both the above methods is the comparatively small amount of water that can be used; larger plates and larger tubes allow 10 c. c. samples to be used, but

it is more satisfactory to use the remainder of the water in the sample bottle. Our sample bottles are glass stoppered, hold about 110-120 c. c. of water, after taking out as much water as is necessary for plates and tubes, 5 to 10 c. c. of four times strength aesculin bile salt broth is poured in, the stopper replaced, and the bottle incubated at 37°-40°C. for 24 hours. If the contents of the bottle turn black we have found that *B. coli* is invariably present, for in the large number of tests by plating from the discolored samples and subculturing, which we have made, we have always succeeded in isolating a typical *B. coli*.

Following the method we have employed we obtain from aesculin agar the *number* of *B. coli* in 5 c. c. of the sample of water, and from our aesculin broth tubes, indication of the *presence* of *B. coli* in 2, 3 and 5 c. c., respectively, and should *B. coli* be absent from all of these, we may safely assume that it is absent from 16 c. c. of the sample water. Our enrichment medium in the sample bottle will inform us if *B. coli* is present or absent in 100 c.c. Absence of black colonies on the plates, and no black discoloration in the tubes, but blackening in the sample bottle, will give us the information that *B. coli* is absent in 16 c. c., but present in 100 c. c. These amounts may be easily varied to suit other requirements.

In conclusion, we may again assert that in the analysis of 60 samples of water we have found the aesculin bile salt test has been correct in 100 per cent. of our samples, or in other words, all samples which give a positive reaction—as indicated by a black color in aesculin bile salt broth—contain "excretal *B. coli*," adopting the definition of Savage[5], or are "flaginac," using the basis of classification suggested by Houston[3].

We have recently found out that the bile salt restrains the growth of some varieties of the coli group. These varieties do not show any well-marked deviation from the

ordinary morphological or cultural characters of *B. coli*, but they are influenced to a certain degree by the presence of the bile salt in the medium, and do not grow quickly or fully when this salt is present in the quantity suggested by McConkey. On this account, we have recently started a number of experiments, comparing aesculin without bile salt, with aesculin with bile salt. Whilst the number of these experiments may not be sufficient to enable us to definitely decide which is the better method, yet the results seem to show that bile salt is not absolutely necessary, and that aesculin bile broth is inferior to the aesculin broth as an *enrichment* medium for *B. coli*, but in all cases, the black discoloration of the aesculin method has been caused by typical *B. coli*.

By positive test we mean that the organism is motile and resembles B. coli in size, typical appearance on gelatine slope, no liquefaction of gelatine, acid production and coagulation in litmus milk, and permanency of this acid. Production of acid and gas in dextrose and lactose media. Canary yellow fluorescence in neutral red media. Production of Indol in five days in peptone water.

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AESCULIN BILE SALT MEDIA FOR MILK ANALYSIS. *

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The routine bacteriological examination of milk in health laboratories usually consists of plating samples in beef peptone gelatine and beef peptone agar, at 20° C. and 37° C., respectively. The plates are counted and the total number of bacteria computed per cubic centimeter of the sample. The species of bacteria present are seldom noted, owing to the large amount of work involved in sub-culturing the various colonies.

The total number of bacteria found in any given sample of milk may or may not give indications of dirty cows and unsanitary utensils and stables, for the milk may have come from clean animals and sanitary stables, but may have been kept in a warm place, which would give a high count. Hence the advisability of introducing a simple method of analysis, whereby the bacteria associated with dirt, manure, etc., may be easily and accurately estimated. Such a method is furnished by the use of aesculin bile salt agar, which will permit of an accurate determination of the number of *B. coli* and *B. aerogenes* present, and thus give information regarding the amount of filth and particularly manure in the sample. One of us in a previous investigation* has shown that *B. aerogenes* is as frequently present in cow manure as *B. coli*, and also that both organisms are

*Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

present in large numbers on the bodies of various species of flies.

We have already pointed out in the paper, "Aesculin Bile Salt Media for Water Analysis," that aesculin in the presence of iron gives black colonies with *B. coli* and *B. aerogenes*, and that both organisms may be counted separately on the plates, on account of the different characters of their colonies.

For routine examination of samples of milk we have usually employed dilutions of 1 in 100 and 1 in 500. For poor milk, however, a higher dilution may be necessary. The diluted milk and the aesculin bile salt agar are mixed together in the plate, and after these have thoroughly set, they are placed in the incubator at 37° C. Counts are made at the end of 24 hours. The black colonies may be readily counted with a white background and the number of *B. coli* and *B. aerogenes* computed, per c. c. More striking results may be obtained by leaving the plates somewhat longer in the incubator, particularly if one wishes to separate *B. coli* from *B. lactis aerogenes*. We have used this method for some 30 samples of milk, with encouraging results. It has always been quite easy to distinguish the coli colonies on account of their blackness. Brown colonies are frequently found on the plates. These, on examination, have proved to be forms which liquefy gelatine. The difference in color between the black and the brown is quite distinct. We cannot yet say if the brown colony has any significance, from a hygienic standpoint. It is certain that not all liquefying colonies will give the brown discoloration, but the medium would be even more useful and valuable if we could ascertain both the number of colonies of the coli group and the number of colonies in the liquefying groups, from aesculin bile salt agar plates.

At this stage of our work, we can hardly suggest a numerical standard for *B. coli*, but we may suggest that if the

100,000 bacteria per c. c. standard is in use, the number of *B. coli* and *B. aerogenes* should not exceed 1000 per c. c., or 1 per cent. Possibly a different standard would be necessary for certified milk, or where the standard was 10,000 bacteria per c. c. These points can be better determined after other laboratory workers have given this method a trial. We are of the opinion—as a result of our analyses—that compared with ordinary beef peptone agar, aesculin bile salt agar gives a better appreciation of the sanitary condition of milk samples, and gives such results in 24 hours. If in routine examination of milk, only one set of plates was made from each sample, we should prefer to use aesculin bile salt agar, as it would give us a better idea of the sanitary condition of the cows, stables, and milking. The details in connection with the preparation of aesculin bile salt agar are given in the paper already referred to, and the results of a number of examinations of milk samples by this method, compared with others, have been submitted in detail to the Milk Committee of the American Public Health Association.

REFERENCE.

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THE RELATIVE PROPORTION OF BACTERIA IN TOP MILK (CREAM LAYER) AND BOTTOM MILK (SKIM MILK), AND ITS BEARING ON INFANT-FEEDING.[1]

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ABSTRACT

In the course of a study on tubercle bacilli in market milk[2], and of a later study of the best procedure for their detection in milk it was noticed that when guinea pigs were inoculated with the cream a very much higher percentage died from acute infections than when the sediment was used. The inference was natural that the cream contained more bacteria than the bottom milk or sediment.

A few preliminary examinations having shown this supposition to be correct, a study was begun as to the number of bacteria in the whole milk, the bottom milk or sediment, and the cream of both that collected by gravity and by centrifugation.

The relative number of bacteria in top milk and bottom milk is of great importance in the modification of milk for infant feeding. Top milk sometimes contains from 10 to 500 times as many bacteria per cubic centimeter as the mixed milk.

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[1]Abstract of paper read before the Laboratory Section of the American Public Health Association at Winnipeg, August 25, 1908.

[2]Anderson, John F.: The frequency of tubercle bacilli in the market milk of the city of Washington, D. C. Bull. No. 41, Hyg. Lab., U. S. Pub. Health & Mar. Hosp. Serv., Wash., 1908, p. 163.

The preponderance of bacteria in top milk may explain why infants sometimes do not thrive on modified milk made from top milk.

As infection depends to some extent on the number of organisms introduced into the body, top milk, on account of its higher bacterial content, may sometimes be more harmful than skim milk.

In 30 samples of milk examined the average number of bacteria in gravity raised cream was 69,211,000, and in the sediment layer 4,360,000 bacteria per cubic centimeter.

In 26 samples of milk the average number of bacteria in gravity and centrifugally raised cream, in the sediment layer, and in the mixed milk was

Gravity		Centrifugalized.		Whole milk
Cream layer	Sediment layer	Cream layer	Sediment layer	
68,690,000	4,840,000	96,690,000	18,840,000	14,388,000

In six samples of milk the average relative number of bacteria in the gravity cream was 15,416,000, skim milk 2,050,000, in the sediment layer 1,405,000, and in the whole milk 2,708,000.

In seven samples of milk the average relative number of bacteria in the centrifugally raised cream was 4,500,000, in the sediment layer 725,900, in the skim milk 119,700, and in the whole milk 619,800.

One sample of milk contained 500 times as many bacteria per cubic centimeter in the cream as in the bottom milk.

When milk is centrifugalized the great mass of bacteria goes up with the cream; a lesser number is carried down in the sediment. The skim milk contains many times less

numbers of bacteria per cubic centimeter than the cream or sediment layers.

Centrifugally-raised cream contains more bacteria per cubic centimeter than the gravity-raised cream from the same milk.

SOME FREAK RESULTS FROM ANIMAL INOCULATIONS.*

By B. L. ARMS, M. D., Bacteriologist, Boston Board of Health Laboratory

It has occurred to me that some of the results out of the usual course might be of interest, consequently a few of our freak results are presented.

All routine animal inoculations are made in duplicate, thereby reducing the chance of failure from loss of the animal inoculated.

Guinea pigs have given perfect satisfaction for rabies, tuberculosis, glanders and K. L. virulence tests which comprise most of our animal work and consequently are used by us almost exclusively, the number under observation at any one time varying from 80 to 200 according to the work on hand.

For rabies inoculations a small jeweler's screw-driver is used, boring through skin and calvarium and the material (an emulsion of hippocampus major, cerebellum and spinal cord ground up in sterile water) is injected subdurally.

The T. B. inoculations are made subcutaneously, and those for glanders intraperitoneally. For the latter we add about 3 c. c. of sterile water to the swabs from the lesions as sent in by the veterinarians, one pig receiving 1 c. c., the other .5 c. c., except in cases showing microscopically large numbers of bacteria, in which case 1-2 and 1-4 c. c. is used, the pigs being referred to as the 1 c. c. and the .5 c. c. pig.

*Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

When making the suspension for glanders inoculations a plant is made on potato, then a smear is made and finding noted on the card sent in and which is filed away with the animal cards when test is finished.

Tuberculosis

November 16, 1906, two pigs were inoculated subcutaneously with pleuritic fluid.

Six weeks later one pig was autopsied, the inguinal glands and spleen presenting the typical tubercular picture and stained smears showed the typical organisms. The other pig showed no enlargement of the glands and was used for an inoculation on a positive rabies case, which will be mentioned later. June 29, 1907, or seven months after inoculation, the pig died and on autopsy the lungs, spleen, liver, colon, adrenals, bladder and one axillary gland were microscopically typical, while the organisms were demonstrated in smears from lungs and spleen.

Rabies.

The head of a dog was received December 22, 1906, examination of sections the following day showed a small number of Negri bodies in the hippocampus major. Two pigs inoculated the day the dog was received died on the following day.

December 24th two more pigs were inoculated with an equal amount of the emulsion; one of these developed a typical paralysis on the 11th day, dying the following day. The other pig showed no symptoms and was autopsied 13 months later, examination of brain negative.

December 29, 1906, another dog's head was examined, many Negri bodies being found in smears and sections of hippocampus major and in sections of cerebellum. Two pigs were inoculated the day the dog was received, one

dying that night, the other being the T. B. pig previously mentioned. This pig showed no symptoms of rabies, although living six months, and the examination of the brain was negative.

December 30th another pig was inoculated with the emulsion from this dog's brain, and this pig was kept under observation for 13 months, when no symptoms having developed, chloroform was given and careful examination of many sections of both hippocampus major and cerebellum gave a negative result.

These are the only instances in which inoculation with material from a case showing Negri bodies has failed to give a positive result in pigs inoculated.

April 1, 1907, we received the head of a dog. Examination of smears and sections failed to reveal Negri bodies, although the gasserian ganglia showed marked proliferation of the endothelial cells of the capsules of the nerve cells. The case was reported as suspicious, diagnosis awaiting result of animal inoculations.

April 2, 1907, two pigs were inoculated, subdurally drawing about .5 c. c. of the emulsion into a hypodermic syringe and putting half of this into each pig. April 24th, or 22 days after inoculation, one pig developed a typical paralysis and was autopsied. Smears from hippocampus major showed many Negri bodies. The other pig developed no symptoms until November 28, 1907, when he showed a slight paralysis. The following day or 242 days after inoculation he was autopsied and smears and sections from the horn and cerebellum showed great numbers of Negri bodies of varying sizes.

Glanders

February 12, 1908, two pigs were inoculated with the material from an ulcer. Stained smears from the pus showed many cocci and suspicious bacilli.

Five days later a small tumor was noticed at site of inoculation. This remained, but there was no slough; inguinal glands became enlarged, scrotum became edematous, but this later subsided. Twenty-five days after inoculation the pig was chloroformed, and on autopsy there was, at the site of inoculation, a mass of caseous pus, inguinal glands were caseous and there were caseous nodules in liver and spleen. Smears from site of inoculation showed typical organisms.

Cultures were made from heart's blood, liver, spleen and site of inoculation. That from the heart's blood was negative, the others positive.

Two pigs inoculated, one with 1 c. c., the other with .5 c. c. of aqueous suspension from these cultures developed characteristic Strauss reaction in 48 hours.

May 5, 1908, two pigs inoculated with a suspension of a nasal discharge. Five days later the .5 c. c. pig showed the characteristic Strauss reaction, and on autopsy the following day typical organisms were found in smears, and typical cultures developed.

On the 1 c. c. pig a tumor was noted at site of inoculation on the 12th, seven days after inoculation. A typical Strauss reaction was present at end of 14 days, when autopsy was made, disclosing a large abscess in the omentum from which organisms were recovered typical both microscopically and culturally. No typical organisms from testes or inoculation site, although cultures were made as well as microscopic examination.

May 7, 1908, two pigs inoculated with a suspension of a seropurulent nasal discharge. On both a tumor was noticed at site of inoculation four days later. The 1 c. c. pig showed a slight Strauss reaction on the 20th, becoming complete, and autopsy was made May 23, 1908. Organisms were microscopically and culturally typical; .5 c. c. pig developed a slight Strauss reaction on the 2nd of June, but

owing to stress of work, autopsy was not made until the 12th with the following findings: Abscess in right groin, right testis intraperitoneal and converted into an abscess, and there were enlargements on both fore ankles and on the left hind ankle. Typical organisms were obtained from both abscesses and from bud on left hind ankle.

May 9, 1908, two pigs inoculated with a suspension from a nasal discharge. On the 15th note was made of a tumor at site of inoculation on the 1 c. c. pig, Strauss reaction present May 18th, when autopsy was made—organisms typical. Tumor was noted on .5 c. c. pig at site of inoculation May 25th, autopsied the following day, finding a tumor in omentum and another in right groin. Microscopical examination negative, typical cultures from both tumors.

May 27, 1908, two pigs were inoculated with material coming from an abscess on the shoulder. The 1 c. c. pig developed typical Strauss reaction in seven days; .5 c. c. pig presented a tumor at site of inoculation, which was noted on the 6th of June, and was autopsied 30 days after inoculation. Tumor at inoculation site was only lesion present. Cultures from this were typical.

June 12, 1908, two pigs were inoculated with material from an abscess on the shoulder. Eight days later more material from the same source was put into the pigs, and at this time a very small tumor was noted on .5 c. c. pig at inoculation site. This sloughed on the 17th day, and a culture was made with negative result. Pig died 25 days after inoculation, and autopsy was made the next day with the following finding: tumor at inoculation site, right testis converted into an abscess, although there was no process just under the tunica vaginalis; just under the skin on left testis, but outside the tunic, there was pus; there were tumors on each extremity and the spleen and liver both showed lesions. Typical organisms microscopically

from two "farcy buds"; culturally from three "farcy buds," and from spleen and heart's blood.

Aside from these cases we have several times failed to get a reaction in the pigs when the potato culture from the swabs showed typical colonies and these injected into pigs proved to be *B. mallei.*

Conclusions

1. All pigs inoculated for T. B. should be autopsied.
2. All negative rabies pigs should be kept under observation for twelve months.
3. All negative glanders pigs should be kept under observation for at least four weeks.
4. All pigs inoculated for glanders dying after 48 hours should be autopsied.
5. Any inoculation may give a freak result, consequently the unusual must be borne in mind.

INVESTIGATION TO FIND THE MOST ECONOMICAL RATIO OF PERMANGANATE TO FORMALDEHYDE FOR USE IN PRACTICAL PERMANGANATE-FORMALDEHYDE DISINFECTION*

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Problem: The permanganate-formaldehyde method of disinfection is becoming very widespread, especially in the smaller towns, villages, and in rural districts; because of its simplicity, absence of apparatus, etc.

Inquiries concerning the "best formula" for use in practice are constantly received; several formulæ have been advised by different authorities, and confusion has arisen. Hence a new method for determining the "best formula" was devised and is here described, with the results so far obtained.

Existing formulæ: The Bureau of Animal Industry recommended practically 8 parts permanganate to 10 parts formalin (40% solution of formaldehyde in water) claiming an evolution of about 50%.

Evans of Maine recommends practically a 4.15 to 10 formula, and McClintic (P. H. & M. H. S. Bull. No. 27), a 5 to 10 formula.

A recent report of an Austrian Government Commission recommends dilution of the formalin with water. McClintic sees no advantage in such dilution, but did not use the formula for mixing here recommended. As there was nothing to show that any of these formulæ were determined in a manner fully comparable with the actual use of the method in

*Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

practice, it was thought well to try the experiments on a working scale with formulæ developed by ourselves.

Experimental work: In collaboration, the writers first devised a small experimental apparatus, which was constructed on principles more likely to give "practical" conditions than those described, testing the evolution of gas from different mixtures, with loose crystals, and cakes, and with diluted formalin, as recommended by the Austrian Commission. The sixty or seventy results obtained showed many interesting points, but since they were repeated with a "full-charge" apparatus, built in our own shop, to our own designs, on a full size working scale, such as we believe has not yet been attempted elsewhere, further reference to these is not necessary. The reason for making these preliminary laboratory tests was that the large scale tests were relatively expensive and difficult; and the smaller scale tests could be made as "feelers" more easily, quickly and cheaply.

Difficulties and side problems: The reaction consists in the oxidation by the permanganate of part of the formaldehyde with the simultaneous reduction of permanganate, this reaction generating much heat, which evaporates the unattacked formaldehyde, together with the water of the formalin. Every change in the proportions in which the two are mixed, and some of the changes in the physical conditions existent at the time, affect the ratio of the amount of formaldehyde *destroyed,* to the amount *evolved.* The "maximum required result from the minimum necessary expenditure" is, of course, the ideal to be sought, i. e., such a ratio as will destroy the least formaldehyde, and evolve the most. Yet, if the maximum *percentage* evolution of formaldehyde be obtained, at a great expenditure of permanganate, the increased cost of the permanganate may offset the increased percentage of formaldehyde. Hence the relative costs of the two enter as an additional problem in determining the *optimum* formula. Finally, every change in the phy-

sical conditions of the experiment affects the results more or less—the surrounding temperature and temperature of the apparatus, the size of the permanganate crystals, their distribution in the container, the temperature of the formalin —all affect the results. Hence it became all the more essential to make full-charge tests under strictly average conditions.

Formaldehyde Full-Charge Tester

The apparatus consists mainly of two galvanized iron cylindrical tanks, an outer one to contain the water, an inner inverted tank or bell, inside of which was suspended the reaction vessel, and to which was connected the absorption jars and suction pump.

Description of Apparatus

The outer tank is 27½ inches in diameter and 42 inches high and was fitted with drain cock at the bottom, otherwise plain. Its capacity is about 10 liters to the vertical inch.

The inner tank or bell is 20 inches in diameter and 33½ inches high, and is suspended from the top of the outer one by iron hooks with its lower edge at the height of 23 inches above the bottom of the outer tank. A row of small holes was made two inches from the bottom of the bell to secure absorption of the gas should it tend to be forced out under the edge. At one side of the top a combined air inlet and water trap was placed to let in air at ordinary pressure and to prevent the escape of gas during the violent reaction. The bell is stayed with wires so that it cannot tip over. At the other side of the top are two three-fourth-inch outlet tubes leading to the absorption jars. In the center a hole was made to admit the separatory funnel containing the formalin.

The absorption jars are one-quart Mason fruit jars, with three-fourth-inch inlet and outlet tubes soldered into the

covers. Four were used in one series, connected to the large vacuum pump, and three in the other, connected to the smaller pump. The water used for absorption was iced to increase absorption of the gas. The inlet tube in each jar was expanded and fluted at the lower end to secure more surface for absorption of the gas in the water. The depth of water over the mouth of the inlet tube was about two and one-half inches. Inasmuch as it was required to draw out and absorb a large quantity of gas in a very short time so as to keep the pressure from rising greatly, one of us (M. G. R.) designed and had the laboratory machinist make two suction pumps of large capacity which require comparatively little water to operate. Their combined capacity is about 25 gallons of air per minute, under the conditions existing in the apparatus. To secure as closely as possible actual conditions, the reaction vessel used was an ordinary 14-quart galvanized iron pail, such as would be available anywhere.

Procedure in Making a Test

The permanganate is weighed out into the reaction vessel (14-qt. pail) which is placed on the supports inside the bell. The latter is then hooked up above the outer tank which is filled with water to a depth of 28 inches, giving a water seal for the bell of three inches above the row of holes, and in case of gas coming out below the bell the water rises about three inches higher, giving five inches of effective absorption.

The trap is adjusted to about one inch of water. The jars are filled about two-thirds full with *ice* water and connected to the outlet tubes, and the pumps are connected to the last jars of the two series. The formalin is placed in the separatory funnel, ready for admission. All being in readiness, the pumps are started and the formalin allowed to flow into the reaction vessel. During the violent reaction which ensues (in 10-30 seconds usually), pressure is sometimes generated, which forces considerable gas out under the bell, but

this has as good an opportunity for absorption (in the water there present) as that going through the jars, which latter is so complete that not more than 1% is found in the two last jars combined.

After the violent reaction is over the pumps are slackened gradually and the traps opened to allow free access of air. At the end of one and one-half hours the apparatus is thoroughly washed down with a small hose into the tank, after which everything is taken apart, the jars emptied into the tank and the water in it thoroughly mixed and sampled.

The residue is also soaked out for about fifteen minutes; the water used measured and a portion saved. In these two samples the formaldehyde is determined by the iodine method; and, by calculation the total amounts found. That in the tank represents the portion evaporated and that in the washings from the reaction vessel the residual. By difference, the amount destroyed is found.

It is believed that the total experimental error in the use of the machine does not amount to over 2% of the amount evaporated, and this is no greater than the variations due to impurities in the permanganate or to variations in the strength of formalin used. The sources of error are:

1. Failure to secure total absorption. The absorption under the conditions was usually within 98-99% of possible, judging from all the available evidence.

2. The titration by the iodine method is not more reliable than within one part in 50, i. e., when a titration gave a result of 38% strength, it could be assumed that the actual strength lay between 37.5% and 39.5%.

3. No doubt, during very violent reactions, a slight loss occurred from gas escaping below edge of bell; but, of course, this occurred seldom to such an extent as to cause appreciable error.

Results Obtained

Summary of Mr. Roberts' results to date (Aug. 21st, 1908,):

1. The best formula for simple mixtures of permanganate and formalin (i. e. with no added water) is as follows:

(a) The *ratio* is 7 parts by weight permanganate to 10 parts by volume formalin. This gives a liberation of from 62 to 65% of the total formaldehyde, the rest being destroyed in the reaction except a small proportion remaining in the residue.

(b) The absolute quantities required to produce the evaporation of *the equivalent of the complete evaporation of* 10 *ounces of formalin* (40% solution of formaldehyde in water) is 11.2 ounces permanganate and 16 ounces formalin—i. e., a reduction of weight, bulk and expense of materials from the existing formula in use here (i. e., 16 ozs. permanganate to 20 ozs. formalin) of about 25%.

2. The best formula for mixtures of permanganate and formalin with *water added* in various proportions, is as follows. (Note—If the humidity is increased, the amount of formaldehyde required to accomplish the same bactericidal effects is greatly reduced. The ideal is enough humidity to saturate the atmosphere, which permits the use of the minimum amount of formaldehyde.)

(a) The *ratio* is permanganate 11, formalin 11, water 9; giving an output of 48% formaldehyde, and evaporation of the total available water.

(b) To secure the equivalent of the *complete evaporation* of five ounces of formalin which is probably all that is required *in the presence of a saturated* atmosphere (i. e., saturated by the simultaneous evaporation *from the mixture* of the added water as well as the water of the formalin solution) the formula is, permanganate, 11 oz.; formalin, 11 oz.; water, 9 oz. This is based upon formalin of the probable average commercial strength, i. e., 38 1-2% formaldehyde;

the permanganate used was approximately 99% pure. If either or both ingredients run appreciably lower in strength than these figures, as they frequently do, the deficiency may be allowed for by portionately increasing the absolute amounts. However, this formula has a margin of safety which takes care of the reasonable variation in good commercial products, i. e., of 2 to 4%. (Note—In buying formalin or permanganate it is well to specify the percentage purity and check the same on receipt of goods.) The percentage saved in bulk weight and expense over the existing formula is 39%. This is secured by virtue of the releasing of a large quantity of water, approximately one pint per thousand cubic feet, reducing the required formalin very greatly.

That this formula (11 ozs. permanganate, 11 ozs. formalin and 9 ozs. water) will yield sufficient gas to kill the ordinary pathogenic bacteria, *under the conditions of high humidity secured,* approximating the saturation point, is readily believed in view of the work showing the efficiency of much smaller amounts of formaldehyde gas under like conditions. But should anyone desire to attain a greater efficiency in any given case, as in the disinfection of rooms infected with anthrax, tuberculosis, or *B. subtilis,* the same *relative* formula may be used, increasing the actual number of ounces proportionately in each case.

It is to be noted that ordinary formalin contains from 6% to 16% of methyl alcohol, the manufacturers stating that this is essential to prevent polymerization—the winter-made formalin containing the larger percentage, the summer-made, the smaller. The above formulæ were worked out on a basis allowing for the presence of the alcohol.

NOTE—Owing to the resignation of Mr. Roberts from the staff, on the completion of his work, certain check experiments contemplated were postponed. His successor, Mr. H. A. Whittaker, Chemist in Charge of Water and Sewage Laboratory, undertook these and reports as follows:

"On the request of Dr. H. W. Hill the chemical work on the foregoing report was duplicated by myself with the same apparatus used by the authors. Similar results were obtained in this second set of experiments, verifying the ratio obtained by the originators as giving the maximum results. Other ratios were tested with the same apparatus and found to generate less formaldehyde gas. The possible sources and probable ranges of error were carefully observed and were found to be as recorded by the authors in their report." H. A. WHITTAKER.

Explanatory Note

A and F=outlets, attached to powerful air suction pump.

B=mason jars, containing ice water, for absorption of formaldehyde.

C=glass tube, forming with T, a water trapped inlet and outlet for bell G.

D=outlets of bell G.

E=separatory funnel, for admission of formalin to part J.

F=see A.

G=galvanized bell, open at bottom, and immersed in water contained in tank M.

H=water level in tank M.

I=wires to steady and center bell G in tank M.

J=pail, galvanized iron, 14 qt., containing permanganate.

K=hooks supporting bell G in tank M.

L=legs of pail J, to receive its weight on lowering bell G.

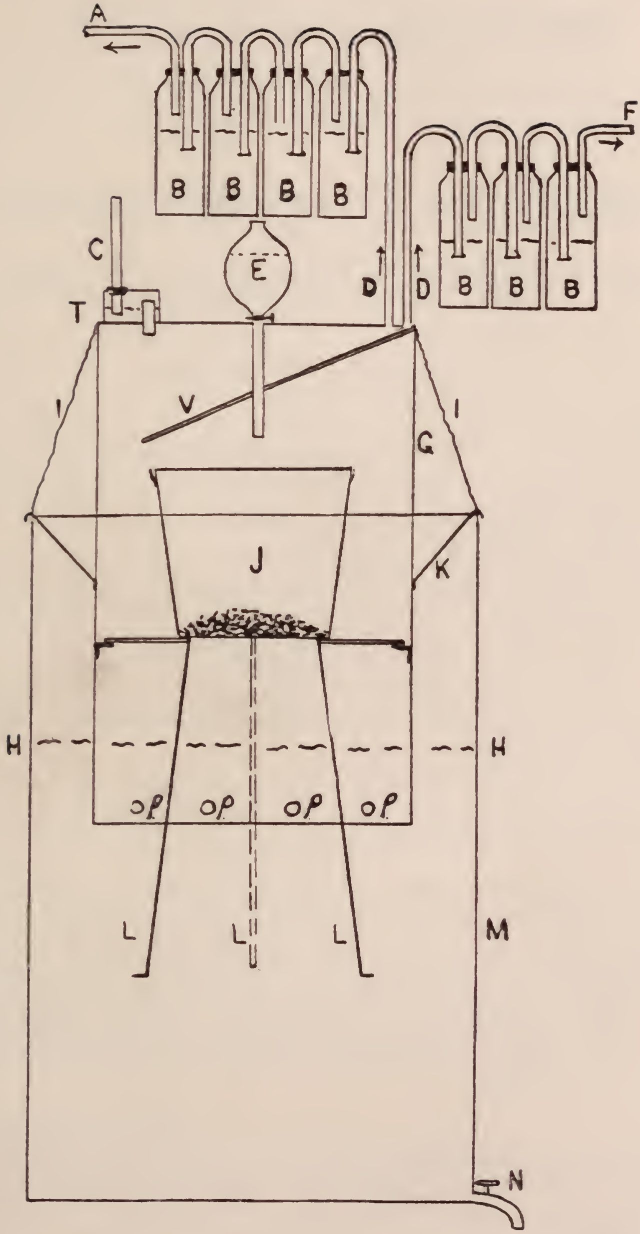
M=tank, galvanized iron, containing water.

N=outlet of tank M.

P=holes near bottom of bell G, to allow escape of surplus gas.

T=trap, see C.

V=veil—a galvanized iron disc, perforated in center for funnel—stem E, to receive and conduct to one side condensation forming on under side of top bell G.



A
F
B B B B
B B B
C
E
D D
T
V
I I
G
J
K
H H
O.P. O.P. O.P. O.P.
L L L
M
N

LONGEVITY OF B. TUBERCULOSIS IN SPUTUM*

By B. R. RICKARDS, F. H. SLACK and B. L. ARMS
Boston Board of Health Laboratory

A Preliminary Communication.

Authorities on tuberculosis are practically unanimous in ascribing the greater part of the spread of this disease to infection with organisms from the sputum of individuals suffering from pulmonary tuberculosis.

Comparatively little work has been done to determine how long tubercle bacilli will retain vitality and remain virulent in the sputum under varying conditions.

Dr. Anna I. Von Sholley reports a series of experiments on 36 pigs†. Dr. John Weinzirl gives an interesting report on work with cultures alone‡.

Acting under the suggestion of Dr. Durgin, and with the authority of the Boston Board of Health, this laboratory began a series of experiments June 25th, 1907.

That these experiments might approximate as closely as possible actual conditions, four rooms were obtained in the tenement house districts; No. 1, dry and sunny; No. 2, dry, well-lighted, but with no sunshine, the exposure being to the north; No. 3, dark and dry (lighted by window from airshaft and window between this and No. 2; No. 4, dark and damp (a basement).

*Read before the Laboratory Section of the American Public Health Association at Winnipeg, August, 1908.

†Report of the Health Department of the City of New York, 1905, Vol. 2, p. 683.

‡Transactions A. P. H. A., Vol. 32, Part 2, p. 128.

These rooms had, of course, to be kept locked, but screened windows were left open in order to obtain circulation of air.

Owing to the difficulty of procuring suitable rooms but two were ready June 25th, Nos. 2 and 3, experiments being started in Nos. 1 and 4 on July 9th.

Technique. Pieces of wooden tongue depressors (representing wood-work) and woolen carpet (representing carpet or rug) about 1½ by ½ inches were immersed over night in a jar of mixed tubercular sputum obtained from one of the city institutions, a separate sample being obtained for rooms 1 and 4. Controls on both were positive.

The pieces of carpet were simply laid on the floors of the rooms but the pieces of wood were held up by string supports so that both sides might be exposed. The samples were collected in sterile test tubes, care being taken to flame the collecting forceps in alcohol that no tubercle bacilli might be carried from one sample to another.

On arrival of the sample at the laboratory about 3 c. c. of sterile water was added to it, and it was allowed to stand 4 to 5 hours. It was then thoroughly rubbed up, and about 1 c. c. of the suspension thus obtained injected subcutaneously into a guinea pig, all tests being made by animal inoculations.

No test was considered positive unless (a) organisms were demonstrated from the lesions or (b) typical pathological lesions were demonstrated microscopically. (In a few instances, usually occurring when the pig died having been inoculated but three or four weeks, it was necessary to make sections from the liver or the spleen.)

First Experiments.

Collections and inoculations were made each Tuesday and Friday until August 23rd. No positives were obtained from Rooms 1 and 4. Two positives on wood were obtained from

Room 2, three and ten days after seeding. Two on wood from Room 3 after 10 days' and 14 days' exposure.

Owing to the fact that no positives were obtained from Rooms 1 and 4, it was decided to repeat the tests, using the same sputum in all the rooms, but as the day when the rooms were seeded was cloudy, another sputum was obtained for use in the sunshine experiments in Room 1. Mixed sputum was used as in the previous experiments.

Second Experiments.

Rooms 2, 3 and 4 were seeded September 6th, and collections made on the 10th, 13th, 16th, daily to the 28th, 30th, October 2d and 4th. Four positives were obtained from Room 2, all being on carpet, after 12, 21, 24 and 28 days' exposure.

Three positives from Room 3, one on carpet after 17 days, two on wood after 10 and 19 days.

Four positives from Room 4, three on carpet after 4, 13 and 17 days; one on wood after 4 days.

Room 1 (sunlight experiments) was seeded September 26th, and collections made hourly for the first day and then discontinued on account of rain. Six collections from each were made, nine being positive and three unsatisfactory, positives being obtained up to the end of the six hours' exposure.

Owing to the difficulty of conducting the experiments, the rooms being located about two miles from the laboratory and at some distance from each other, and to the inconsistency of the results obtained, many negatives being followed by a positive in several instances, it was decided to run a new set of experiments in the laboratory itself where the varying factors could be more directly under our control.

RESULTS OF FIRST SET OF T. B. EXPERIMENTS

Date	Room 1 Carpet	Room 1 Stick	Room 2 Carpet	Room 2 Stick	Room 3 Carpet	Room 3 Stick	Room 4 Carpet	Room 4 Stick	Totals Pos	Totals Neg	Totals Uns	Total
June 25			Seeded		Seeded							
June 28			–	+	uns.	uns.			1	1	2	4
July 2			–	uns.	–	–				3	1	4
July 5			–	+	–	+			2	2		4
July 9	Seeded		–	–	–	+	Seeded		1	3		4
July 12	–	–	–	uns.	–	–	uns.	–		6	2	8
July 16	–	–	–	uns.	–	–	uns.	–		6	2	8
July 19	–	–	–	–	–	–	–	–		8		8
July 23	–	–	uns.	uns.	–	uns.	–	–		5	3	8
July 26	–	–	–	uns.	–	–	–	–		7	1	8
July 30	–	–	–	–	–	–	–	–		8		8
Aug. 2	–	–	–	–	–	–	–	–		8		8
Aug. 6	–	–	–	–	–	–	–	–		8		8
Aug. 9	–	–	–	–	–	uns.	–	–		7	1	8
Aug. 13	–	–	–	–	–	–	–	–		8		8
Aug. 16	–	–	–	–	–	–	–	–		8		8
Aug. 20	–	–	–	uns.	–	–	–	–		7	1	8
Aug. 23	–	–	–	–	uns.	–	–	–		7	1	8

RESULTS OF SECOND SET OF T. B. EXPERIMENTS

Date of col.	Room 1 Carpet	Room 1 Wood	Room 2 Carpet	Room 2 Wood	Room 3 Carpet	Room 3 Wood	Room 4 Carpet	Room 4 Wood	Pos.	Neg.	Uns.	Tl.
Sept. 10			–	–	–	–	+	+	2	4		6
" 13			–	–	–	–	Uns.	–		5	1	6
" 16			–	–	–	+	Uns.	–	1	4	1	6
" 17			–	–	–	Uns.	–	–		5	1	6
" 18			Uns.	–	–	–	–	–		5	1	6
" 19			–	–	–	–	+	–	1	5		6
" 20			–	–	–	–	–	–		6		6
" 21			–	–	–	uns.	–	–		5	1	6
" 22			–	–	–	–	–	–		6		6
" 23			–	–	+	–	+	–	2	4		6
" 24			–	–	–	–	–	–		6		6
" 25			–	–	–	+	–	–	1	5		6
" 26	(4+ (2 uns)	(5+ (1 uns)	–	–	–	–	–	–	9	6	3	18
" 27			Uns.	–	–	Uns.	–	–		4	2	6
" 28			–	–	–	–	Uns.	–		5	1	6
" 30			Uns.	–	–	–	Uns.	–		4	2	6
Oct. 2			–	–	–	–	–	–		6		6
Oct. 4			Uns.	–	–	–	–	–		5	1	6
									16	90	14	120

The following modifications of technique were used:

1. Sputum obtained from a single individual was used, control inoculations being made long enough in advance of the inoculations to show that we were dealing with a virulent organism.

2. Sputum was thoroughly shaken to obtain uniformity, and a large drop of the mixture thus obtained was placed on each piece of carpet or stick used.

This gives more nearly the condition of sputum as expectorated, although, of course, the amount used was much smaller.

Third Experiments.

For control, on these experiments two pigs were inoculated December 9, 1907, with sputum from a single patient. One of these controls developed so rapidly that it was possible to demonstrate typical organisms from the inoculation site and inguinal glands by December 20; the other autopsied at a later date was also positive.

On December 23 pieces of carpet and stick were seeded with a second sample from this patient.

Part of these were exposed in a box with a glass front and a cloth back on a high bench behind the microscope bench, the front of the box facing the north windows. These specimens thus obtained abundant diffuse light, but no sunlight, conditions corresponding to Room 2 in the previous experiments.

Others were exposed to the air in a box in a dark stock room, all artificial light excluded by a cloth hung over the front, tacked to the top and sides, conditions corresponding to Room 3. Pigs were inoculated December 26th, and every other day thereafter as long as the material exposed lasted.

From the specimens exposed to light and air the following results were obtained:

Carpet, 8 positives, covering 19 days' exposure, one negative being obtained after 15 days, and all being negative after 19 days; tests covered 57 days.

Wood, 12 positives, covering 31 days' exposure. During this time there were two negatives after 25 and 29 days and one unsatisfactory after 21 days. No further positives were obtained, although the tests covered a period of 70 days.

From the specimens exposed to the air, but kept in the dark, results were as follows:

Carpet, 17 positives. The first 16 tests made were positive, covering 35 days' exposure. No positives were obtained in the next thirty days, when as a result of "rubbing up" two specimens together and making an inoculation one positive was obtained. Although this was repeated for the remaining three inoculations, there were no more positives. The tests covered a period of 70 days.

Wood, 42 positives. One negative was obtained after 71 days' exposure, and there was one unsatisfactory test after 39 days. No end point was reached, positive results being obtained up to 88 days. These tests are being repeated.

One hundred and ten pigs are also now under observation in a series of sunshine experiments using sputum deposited on brick as well as wood and carpet, these specimens being exposed to the direct sunlight on the roof of the building in which the laboratory is situated, hourly inoculations being made from 8 A. M. to 6 P. M. Sputum has for some time been exposed and inoculations will soon be made in tests approximating Room 4 (dark and damp).

Subsequent Tests.

Brick, first day's exposure, 9+ from 12 inoculations.
Brick, second day's exposure, 8+ from 18 inoculations.
Brick, latest + after 31 hours' exposure to weather.
Stick, first day's exposure, 3+ from 8 inoculations.
Stick, latest + after 5 hours' exposure.
Carpet, 2 positives, after 1 and 7 hours' exposure.

Although by no means ready to draw final conclusions from this work the results of the experiments so far concluded indicate:

1. In order to obtain consistent results in experiments of this kind (a) sputum from a single individual which has been tested and found to be virulent should be used; (b) the sputum should be thoroughly mixed by agitation in order that any particle may be a fair sample of the whole; (c) all the conditions should be under the control of the investigator, weather necessarily being excepted.

2. Tubercle bacilli in sputum deposited on carpet will die out much more rapidly than when deposited on wood.

3. As on wood in the dark and dry tests virulent bacilli persisted for three months, and end point not being reached, it is evident that sputum of tubercular patients cannot be too carefully cared for.

4. It is also apparent that the so-called "tubercular houses" are a real menace to the health of a community.

Date	Approx No. 2 Carpet	Approx No. 2 Wood	Approx No. 3 Carpet	Approx No. 3 Wood	Pos.	Neg.	Unsat	Totals
Dec. 26	+	+	+	+	4			4
" 28	+	+	+	+	4			4
" 30	+	+	+	+	4			4
Jan. 1	+	+	+	+	4			4
" 3	+	+	+	+	4			4
" 5	+	+	+	+	4			4
" 7	–	+	+	+	3	1		4
" 9	+	+	+	+	4			4
" 11	+	+	+	+	4			4
" 13	–	uns.	+	+	2	1	1	4
" 15	–	+	+	+	3	1		4
" 17	–	–	+	+	2	2		4
" 19	–	+	+	+	3	1		4
" 21	–	–	+	+	2	2		4
" 23	–	+	+	+	3	1		4
" 25	–	–	+	+	2	2		4
" 27	–	–	–	+	1	3		4
" 29	–	–	–	uns.		3	1	4
" 31	–	–	–	+	1	3		4
" 2	–	–	–	+	1	3		4
" 4	–	–	–	+	1	3		4
" 6	–	–	–	+	1	3		4
" 8	–	–	–	+	1	3		4
" 10	–	–	uns.	+	1	2	1	4
" 12	–	uns.	uns.	+	1	1	2	4
" 14	–	–	–	+	1	3		4
" 16	–	–	–	+	1	3		4
" 18	–	–	–	+	1	3		4
" 20		–	–	+	1	2		4
" 22		–	–	+	1	2		3
" 24		–	–	+	1	2		3
" 26		uns.	+	+	2		1	3
" 28		–	–	+	1	2		3
Mar. 1		–	–	–		3		3
" 3		–	–	+	1	2		3
" 5				+	1			1
" 7				+	1			1
" 9				+	1			1
" 11				+	1			1
" 13				+	1			1
" 16				+	1			1
" 18				+	1			1
Totals	28	35	35	42	77	57	6	140

The following papers read at the meeting of the Laboratory Section at Winnipeg were not received for publication:

"Experimental Leucocytosis in the Cow's Udder," Conrad Hoffman.

"The Individual Animal as a Factor in the Germ Control of Milk Supplies," E. G. Hastings and Conrad Hoffman.

"The Waters of the Great Lakes," R. B. Dole.

"Some Studies of the Physiological Leocyte Content of Cow's Milk," B. H. Stone and L. P. Sprague (Journal of Medical Research, 1909).

"A Comparison of Practical Methods for Determining the Bacterial Content of Milk," P. G. Heineman (Journal of Infectious Diseases, Vol. V., p. 412).

"Stability and Putrescibility in Sewage Filter Effluents," E. B. Phelps.

"Tests for the Significance of Gas-Producing Bacteria in Milk," D. D. Jackson and H. W. Streter.

Vital Statistics Section

THE MARYLAND BIOMETER AND SOME OF ITS MATHEMATICAL RELATIONS*

By MARSHALL LANGTON PRICE, M.D.
Baltimore

The science of vital statistics is to the sanitarian what the chart and compass is to the navigator. It can no more be expected that the sanitarian will steer a straight course without the aid of vital statistics, than that the navigator will reach his goal without his chart and compass. There is, however, this important difference: the sailor cannot go wrong and not know it, but the hygienist can steer a false course and never know how many lives his mistakes have been the means of wrecking.

The hygienist moreover does not start out with a definitely fixed goal, but must steer his course according to the conditions he meets in his voyage. He must meet constantly changing and complex conditions, all of which require close study and observation for which, through the irony of fate, circumstances seldom allow time, even for the careful study of the simplest elements. If all these complex and changing elements allow of generalization, the broad purpose which the sanitarian must keep in mind is threefold. First, to increase the birth rate; second, to diminish the death rate; third, to increase the duration of life. The last of these three main elements is the most important, and is the true measure of sanitary efficiency; for the death rate may be low and yet the deaths may all have occurred in young per-

*Read before the Vital Statistics Section of the American Public Health Association at Winnipeg, August, 1908.

sons from wholly preventable causes, and the duration of life fall far below a proper median, or the death rate may be high but the deaths have occurred among the old whom nature has largely removed from the influence of sanitary government, and, consequently, the duration of life will be above the median. The birth rate has been shown, futher, to be, at least to some extent, independent of sanitary conditions and indeed of sanitary control.

As we must recognize the duration of life to be the best, and, indeed, the only proper measure of sanitary efficiency, it is most surprising that the public health authorities have not generally made use of the only means at their disposal for measuring the efficiency of their work. The only attempts that have been made by the health authorities of the states and cities of the United States along this line, have been the publication of tables giving the average age at death, upon the assumption that this figure is equal or equivalent to the duration of life. Our most eminent statisticians have so frequently pointed out the fallacy of this argument that it is scarcely necessary to refer to it here. The real reason why life tables are not more frequently used is, doubtless, because of their complexity and of the fact that the life tables in common use are not well adapted to the purpose of sanitary government. It will, perhaps, best illustrate this point to refer briefly to the history of life tables and their use down to the present day.

About the year 1855 the late Dr. Farr, then Registrar-General of England, constructed a series of tables, later to become in familiar use by actuaries and other statisticians under the name of "life tables." To such a table as affording an efficient measure of the "life" of a community Dr. Farr applied the name "biometer." These tables marked a new and wide field in the handling of statistics, and particularly in that branch of statistics known as "vital statistics." Dr. Farr's tables were applied to the whole people

at large, but their use in the present day (certainly in the United States), is largely confined to a special class of people with whom the insurance companies do business. The insurance tables are constructed from accepted risks and are known as "Healthy Males" or "Healthy Females" tables. Such tables are generally constructed to show the expectancy of life at certain age periods, or to show the "probability of living one year." Such tables constructed to apply only to the healthy, are necessarily not of great advantage to the sanitarian whose work mainly is concerned with the diseased. These tables have, moreover, another serious defect. The sanitarian is not only interested in knowing the general duration of life, or the expectation of life at a given age period, but in noting the particular period at which the loss or gain appears. The expectancy of life is, further, only an average of the condition existing beyond the age period for which the calcu-

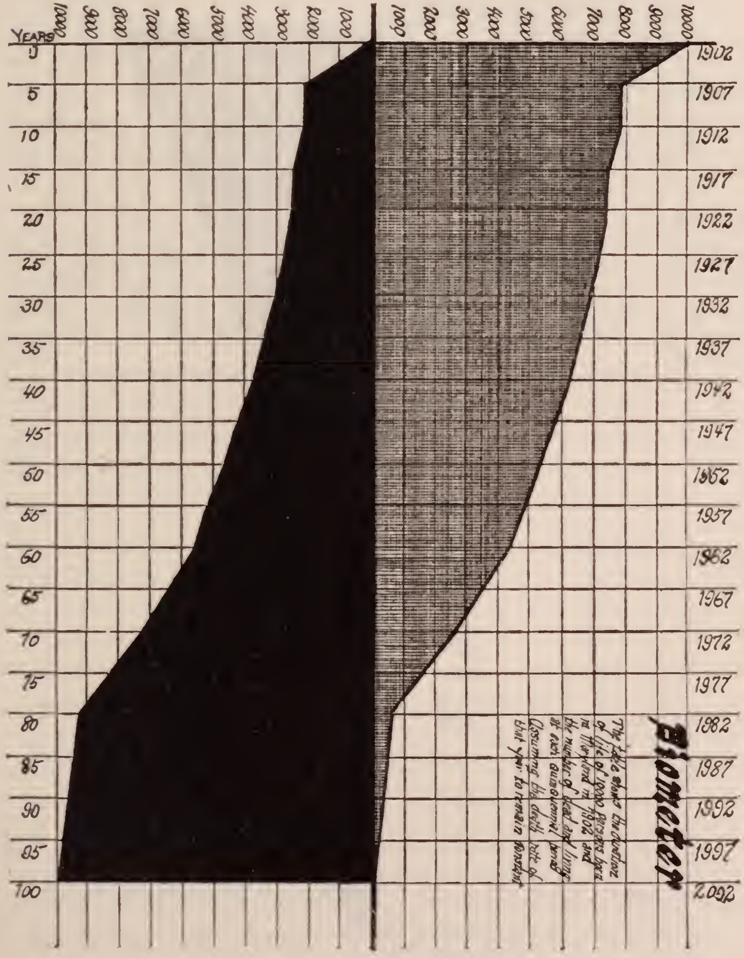
TABLE I.

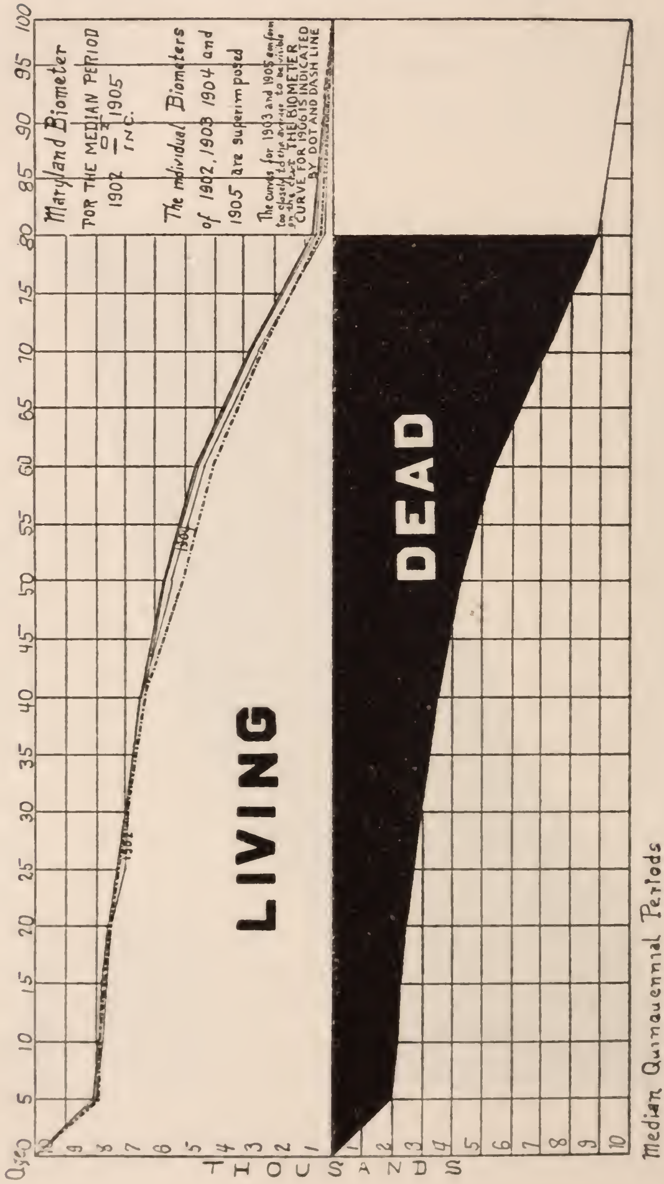
MARYLAND, 1906—BIOMETER TABLE

Ages	Per Cent.	Estimated Population	Deaths	Mortality per 1000 Annual	Mortality per 1000 Age Period	Deaths in Age Period	Survivors of 10000 Born 1906	A. D.
0. 5	11.36	145976	6127	41.97	209.65	2099	7901	1911
5.10	11.21	144048	501	3.48	17.40	130	7771	1916
10.15	10.66	136981	384	2.83	14.15	110	7661	1921
15.20	10.13	130171	615	4.73	23.64	181	7480	1926
20.25	9.06	116421	—	—	—	—	—	—
25.30	8.58	110253	1677	7.39	73.90	553	6927	1936
30.35	7.17	92135	—	—	—	—	—	—
35.40	6.68	85838	1594	8.96	89.60	621	6306	1946
40.45	5.80	74530	—	—	—	—	—	—
45.50	4.73	64521	1780	19.99	199.90	1261	5045	1956
50.55	4.07	52300	—	—	—	—	—	—
55.60	3.09	39707	1870	20.33	203.30	1026	4019	1966
60.65	2.57	33025	—	—	—	—	—	—
65.70	1.80	23130	2172	38.67	386.70	1554	2465	1976
70.75	1.23	15806	—	—	—	—	—	—
75.80	0.79	10152	2158	83.13	831.30	2049	416	1986

lation is made. Hence if graphic curves are used, eccentricities in the curve caused by unusual conditions at a given age period are obscured or lost by compensating eccentricities at later age periods. For these reasons a table of survivorship is used in the construction of the "Maryland Biometer." Tables of survivorship are not new in vital statistics, but the merit which is claimed for the "Maryland Biometer" is its simplicity of construction from figures which are always available, and the manner of indicating the survivorship graphically. This Chart is shown in figure 1. It is possible by applying a compass to any part of the curve to get the number of living and the number of dead out of the unit population at the year of calculation. The Maryland Biometer is like other charts of the same character, prognostic of the future; that is, it assumes the mortality conditions of the year for which the calculation is made to remain constant for a certain period (eighty years is taken as a basis for reasons which will appear upon examining the chart). Ten thousand is taken as a unit of population, and a population of ten thousand, born in the year for which the biometer is constructed, is traced under the conditions of that year for eighty years subsequent. The biometer shows how many will be living, and how many dead at the succeeding quinquennial periods. This calculation is approximately correct and readily admits of comparison with preceding or succeeding years. The following data are necessary for the calculation (all of which is given for the year 1906 in Table 1): 1. Deaths by quinquennial periods for 1906 (taking 1906 as an example). 2. Estimated population for 1906. From these data we can obtain: 3. Death rate annually for the quinquennial periods. 4. Death rates for the age periods. If these figures are applied first to ten thousand persons between 0 and 5 years, and then to the survivors (after deducting the deaths in the manner shown in Table 1), we will

obtain the figure shown in Fig. 2, in which the broken line indicates the survivors from the year 1906 to 1986. (The upper light portion represents the living, and the black lower portion the dead.)




Maryland Biometer
FOR THE MEDIAN PERIOD OF 1902 — 1905 INC.
The individual Biometers of 1902, 1903, 1904 and 1905 are superimposed
THE BIOMETER CURVE FOR 1906 IS INDICATED BY DOT AND DASH LINE
LIVING
DEAD
THOUSANDS
Median Quinquennial Periods

As the human race is necessarily mortal, all of the living population represented above the base line must eventually cross the line and appear among the dead population below the line, but it is in the manner of their crossing (that is in the form of the curve), by which we measure the vital condition of the community. The ideal biometer will have a broad flat apex, not declining materially until the seventieth year, when the degenerations of age, now beyond the control of sanitarians, become the predominate influence. The following is the survivorship table in Maryland for the year 1902:

Number born in 1902	10,000
Number reaching the age of 5 years (A. D. 1907)..	7,885
Number reaching the age of 10 years (A. D. 1912)..	7,745
Number reaching the age of 15 years (A. D. 1917)..	7,640
Number reaching the age of 20 years (A. D. 1922)..	7,457
Number reaching the age of 30 years (A. D. 1932)..	6,913
Number reaching the age of 40 years (A. D. 1942)..	6,346
Number reaching the age of 50 years (A. D. 1952)..	5,591
Number reaching the age of 60 years (A. D. 1962)..	4,512
Number reaching the age of 70 years (A. D. 1972)..	2,770
Number reaching the age of 80 years (A. D. 1982)..	665

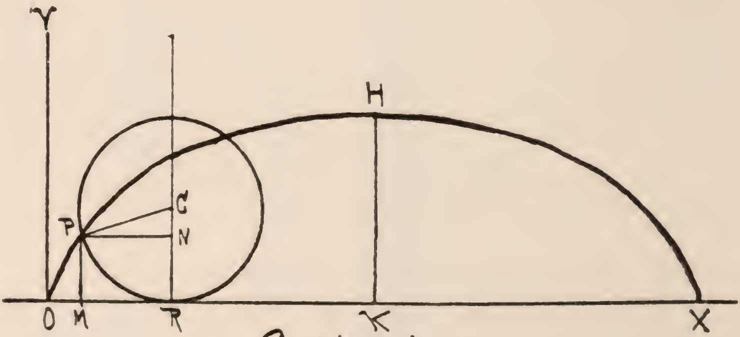
These figures with their differences furnish the plus and minus ordinates of the chart.

Properties of the Biometer

If we examine the Biometer, as shown in Fig. 1, we will observe that the life line (above) is a curve consisting of three parts, each conforming to a distinct equation. It is advisable to consider only that part of the curve constructed from the above table and extending from birth to the eightieth year, eliminating all ages over eighty, both because the population over eighty is too small to furnish

even approximate results, and because of the well-known inaccuracy of ages returned on death certificates after the eightieth year. There then remains two curves to be considered in the life line, one markedly eccentric extending from birth to the fifth year, the remainder fairly regular up to the eightieth year. The first five years of life show such a heavy mortality that they cannot be made to conform to any equation representing the later years of life.

The young recruits in life's battle are met on their arrival on the field by such a hot fire that they are literally decimated before they can take cover and secure themselves from all but the chance bullets that they meet with during the remainder of their life. The first five years must thus be considered a period of adjustment. Eliminating the ages below five we have left a curve somewhat similar to the transcendental curve known as the "cycloid"—that is, the second half of the branch, or the portion HX of the curve OHX.



Cycloid

The common equation of the cycloid is as is well known,

$$x = r \text{ vers.}^{-1}\frac{y}{r} + \sqrt{2ry - y^2}$$

Since we only desire to compare the ordinates of the cycloid, we may use the simultaneous equations,

$$x = r(\Theta - \sin.\Theta)$$
$$y = r(1 - \cos.\Theta)$$

which are the simultaneous equations of the cycloid.

Since we wish further only the values of the ordinate, y, at any point of the curve, we have only use for the second equation,

$$y = r(1 - \cos.\Theta)$$

It now remains to determine the values of y in the portions of the cycloid whose ordinates correspond to the ordinates of the several quinquennial periods of the Biometer; in other words, to determine how closely the Biometer curve corresponds to the cycloidal curve. As we commence the cycloidal curve from the fifth year and extend it to the eightieth year, the ordinate of the fifth year will represent the line HK, which is equal to a surviving population of 7885.

Hence $D = 7885$ (diameter of generatrix)

$r = 3942.5$

$\Theta =$ the angle of revolution (PCR in the figure).

Since the generatrix will make one complete revolution from O to X, Θ will represent values from 0° to 360°, and since there are fifteen age periods from H to X or from 180° to 360° each successive angle will be greater than the preceding by 12° 0′.

At 5 years	$\Theta = 180° \, 0'$	nat. cos.	1.000000 with — sign
10 years	$\Theta = 192° \, 0'$		0.978148
15 years	$\Theta = 204°$		0.913545
20 years	$\Theta = 216°$		0.809017
25 years	$\Theta = 228°$		0.669131
30 years	$\Theta = 240°$		0.500000
35 years	$\Theta = 252°$		0.309017
40 years	$\Theta = 264°$		0.104528

45 years $\Theta=276^\circ$	0.104528 with + sign
50 years $\Theta=288^\circ$	0.309017
55 years $\Theta=300^\circ$	0.500000
60 years $\Theta=312^\circ$	0.669131
65 years $\Theta=324^\circ$	0.809017
70 years $\Theta=336^\circ$	0.913545
75 years $\Theta=348^\circ$	0.978148
80 years $\Theta=360^\circ$	1.000000

We may now determine the values of y in the equation

$$y=r(1-\cos.\Theta)$$

where $r=3942.5$ and the successive values of Θ are as given in the above table.

To determine the population surviving at any given age period according to the cycloidal curve, we must first determine the population surviving at the end of five years. To do this we subtract 20% of the original population then:

$P-20\%P=$ number living at the end of five years.

$$D=P-20\%P$$

$$r=\frac{P-20\%P}{2}$$

and the value of Θ for the given age period will be the proportionate part of the arc between 180° and 360°, representing the ages from 5 years to 80 years.

Thus at 21 years

$$\Theta=21/75\times180^\circ=50^\circ/24'$$

which will give an approximate result when applied in the equation. For the population of 10,000 used in the construction of the Biometer we obtain the value of y (or surviving population) at quinquennial periods as follows:

In the equation $y=r(1-\cos.\Theta)$, at 5 years $\Theta=180^\circ$, $\cos.\Theta=1$; hence

$$y=3942.5(1-\cos.90^\circ)$$

and since Θ has the minus sign in this part of the curve

$$y=3942.5\times2=7885$$

which gives the population at 5 years equal to the axis of the cycloid HK.

At the age of 10 years $\Theta=192^\circ\ 0'$, and cos. $\Theta=0.978148$.

Apply these values in the above formula,

$$y=3942.5\times1.978148=7809$$

The values of y in the cycloid from five to eighty years appear in the following table:

At 5	years	y=7885
10	years	y=7799
15	years	y=7544
20	years	y=7132
25	years	y=6580
30	years	y=5914
35	years	y=5161
40	years	y=4355
45	years	y=3530
50	years	y=2724
55	years	y=1971
60	years	y=1305
65	years	y= 865
70	years	y= 341
75	years	y= 87
80	years	y= 0

A more nearly approximate result will be obtained by considering the cycloidal curve to terminate at the 95th year; this curve will also be more in accordance with the facts. In this equation $\Theta=10^\circ\ 0'$.

At 5	years	y=7885
10	years	y=7825
15	years	y=7647
20	years	y=7357
25	years	y=6962
30	years	y=6477

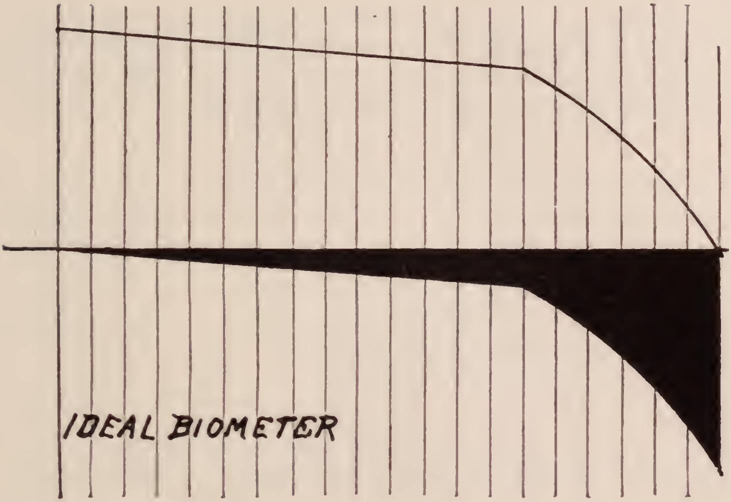
35	years	y=5914
40	years	y=5291
45	years	y=4527
50	years	y=3943
55	years	y=3258
60	years	y=2594
65	years	y=1971
70	years	y=1408
75	years	y= 923
80	years	y= 523
85	years	y= 238
90	years	y= 60
95	years	y= 0

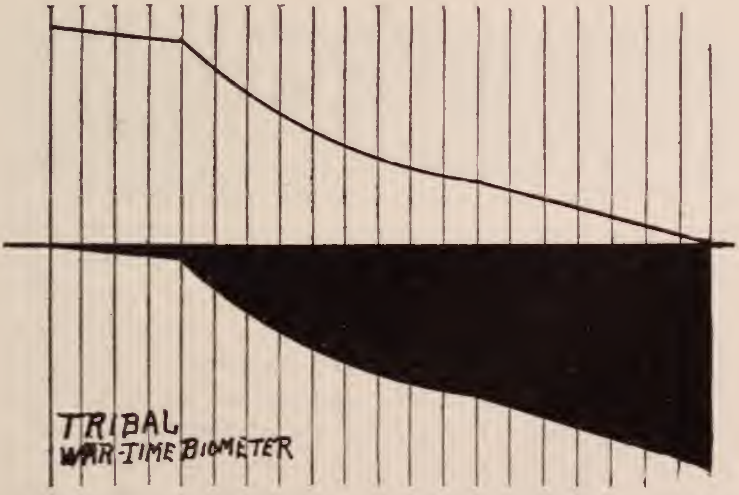
It will be seen by comparison of the figures of this last table with those of the Biometer that they correspond approximately only up to the thirtieth year.

It is in the middle period of life that sanitation has produced its appreciable effects, and the cycloid can only be considered a true "life curve" for savage and semi-civilized communities. It may be characterized as the "natural life curve" in contradistinction to the "artificial life curve" seen in the Biometer of civilized communities.

Different Varieties of Biometers

The profits of hygiene are to be gained almost wholly in the control of communicable disease, congenital deficiencies and senile degeneration being yet wholly beyond sanitary control; hence the ideal biometer should have a broad flat apex, almost level until the seventieth year, after which it declines with greater or less abruptness. This ideal curve is shown in the figures:





The biometric method can be applied with especial facility to a portion of the population, a selected number, or class. The biometer of a savage tribe during war would present the form shown in the figure.

Example:—

During the year 1833, 105,463 children were born in a European empire. How many will be living in 1855, assuming their mortality to follow the cycloidal curve?

$$5\text{-}95 \text{ years } \Theta = 180^\circ\text{-}360^\circ$$

$$5\text{-}22 \text{ years } \Theta = 180^\circ\text{-}224^\circ$$

Population surviving after 5 years, 105,463—21,093=84,370

Population surviving at 5 years = y.

$$y = r(1 - \cos.\ \Theta)$$

$$y = 42{,}185(1 - \cos.\ 224^\circ)$$

$$\log.\ 42{,}185 = 4.625159$$

$$\log.\ 1.7193 = 0.235352$$

$$4.860511 \ (\log.\ y)$$

Nat. No. 72,529=Population surviving at 22 years. *Ans.*

The figures for the biometer shown so far are for the year 1902, while the charts show a median figure for the years 1902-1905 inclusive. These figures may be well compared with the biometer of 1906, shown in the upper lines in Figs. 1 and 2. The biometer for this year is distinctly abnormal and differs more widely from the cycloid curve than the curve of any preceding biometer, as may be seen by reference to the figures. The normal biometer is a homologous curve, uniformly convex throughout, and conforming rather closely to the cycloidal curve. The biometer of 1906, however, shows two marked irregularities which may be noticed in the concavities appearing at the thirtieth and fiftieth years, Fig. 3. The whole curve, moreover, falls considerably below the cycloid curve. The reason for this unfavorable showing in 1906 has not yet been worked out.

The biometer may be used in another way to establish a standard. It will be noticed that there are 160 squares in the table from 5 to 80 years. If all the persons shown in the chart survived to their eightieth year all of the

squares would be included within the biometric curve. The perfect biometer could, therefore, be indicated by the equation $\frac{160}{160}$, while the usual biometer would be approximately $\frac{124}{160}$. A more accurate result can be obtained by computing the area of the trapezoids not included in the biometer curve by the equation (Area=$\frac{1}{2}$ product of the parallel sum of the sides by the altitude).

In order to make the biometers of successive years comparable all are drawn to the same scale and the ratio of the base to the altitude is made the same as in the cycloid, viz.: 100 : 157*. The most convenient method is to make the base 157 Cm. and the altitude 100 Cm. This makes a biometer of the size shown.

It has been shown, I hope, how readily a biometer can be constructed from the figures available in the office of every registrar of vital statistics, and I hope the use of biometers will become more general and their value more fully appreciated by sanitary administrations in this country.

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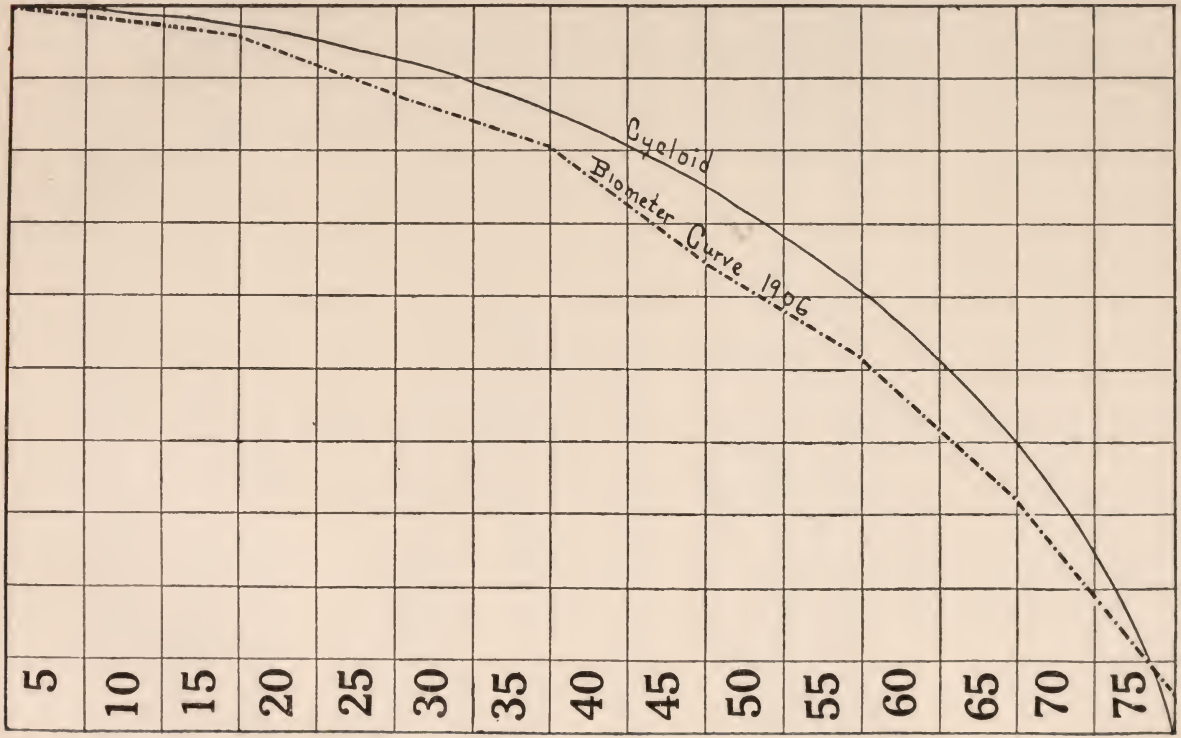
*This ratio has not been followed by the draughtsman.



Born 1906 10000	By Calculation	Cycloid equivalent y=r(—1 cos B)
Surviving 5 years later 1911	**7901**	7901
Surviving 10 years later 1916	**7771**	7861
Surviving 15 years later 1921	**7661**	7779
Surviving 20 years later 1926	**7480**	7657
Surviving 30 years later 1936	**6927**	7331
Surviving 40 years later 1946	**6306**	6720
Surviving 50 years later 1956	**5045**	5906
Surviving 60 years later 1966	**4019**	4765
Surviving 70 years later 1976	**2465**	2688
Surviving 80 years later 1986	**416**	0

THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH

JULY QUARTERLY MEETING

Boston, Mass.

The quarterly meeting of the Association was held at Gallup's Island, Boston Harbor, on Thursday, July 22, 1909, President Walcott presiding.

The Association on recommendation of the Executive Committee elected the following members of the Association:

Herbert M. Larrabee, M. D., of the Tewksbury Board of Health.

Fred H. Rounds, of the Melrose Board of Health.

Gilman L. Chase, M. D., Milk Inspector and Bacteriologist, Clinton Board of Health.

Henry D. Chadwick, M. D., Superintendent Westfield State Sanitorium, Westfield.

Thomas E. Maloney, V. S., of the Fall River Board of Health.

E. W. Babson, M. D. V., of Gloucester.

Calvin G. Page, M. D., of Boston.

W. G. Turner, M. D., of the Fall River Board of Health.

Winthrop S. Blanchard, M. D., Boston Board of Health Laboratory, 30 Huntington Ave., Boston.

Cecil K. Blanchard, B. S., Sanitary Expert and Bacteriologist for Wellesley.

Charles S. Holden, M. D., of the Attleboro Board of Health.

Ralph P. Kent, M. D., of the Attleboro Board of Health.

J. Albert Simpson, Inspector of Milk, Milton.

H. H. Nevers, M. D., Bacteriologist, Lawrence Board of Health.

Alfred C. Smith, M. D., of Brockton.

Dr. Darius W. Gilbert, Inspector of Animals, Cohasset.

DR. SWARTS. I would like to place in nomination for membership on the honorary list the name of Mr. Burt R. Rickards, who previously was (or is) a member of this Association, actively connected with its interests, but who has removed from Boston to the work of the State Board of Health of Ohio. He was connected with the city board as bacteriologist, having charge of its laboratory, and is connected with the publication of this Association, as I understand it, as editor.

I would take the privilege of presenting his name for the honorary list. (Motion carried.)

REPORT OF THE COMMITTEE ON MILK LEGISLATION.

The Committee on Milk Legislation, appointed one year ago, desires to report that it was successful in securing the legislation sought for.

As was reported quite fully at the regular meeting last October, the Committee ascertained the sentiment of practically all the local boards of health of the state, which was overwhelmingly in favor of placing all matters connected with the inspection of milk under the jurisdiction of the local boards. As directed by vote of the Association at that meeting the Committee introduced a petition for such legislation and appeared at the hearing given by the legislative Committee on Public Health.

Quite a number of health boards sent representatives to help at this hearing. We met some opposition from several sources but secured a favorable report on the bill from the legislative committee. The bill passed the House easily but met with considerable opposition in the Senate. Here it was amended in two particulars. One provided that any removals from office of milk inspectors should be in accordance with civil service rules. This amendment we did not regard adversely. The other amendment provided that in towns the compensation of milk inspectors should be determined by the selectmen. This amendment we did not regard so favorably as it is obvious that in case the selectmen of any town were not in sympathy with the efforts of the board of health in the matter of milk inspection by virtue of controlling the finances they could easily stop the work. In this connection it may be said that if any hardship is experienced by reason of this, action can be taken at the

next session of the Legislature to have the matter adjusted so that the boards of health of towns can also govern the financial side.

The Senate amendments were, after some skirmishing, concurred in by the House and the bill was signed by the Governor on May 19th and became a law on that date.

The text of the Act is as follows:

An act to provide for the appointment of inspectors and collectors of milk by boards of health.

Be it enacted, etc., as follows:

Section 1. The boards of health of cities shall, and boards of health of towns or the selectmen acting as such boards. may, appoint one or more inspectors of milk for their respective cities and towns. In cities such inspectors, after appointment, may be removed from office in accordance with the provisions of chapter three hundred and fourteen of the acts of the year nineteen hundred and four; in towns they may be removed at any time by the appointing board. Such inspectors shall have the powers and perform the duties now conferred and imposed by law upon the inspectors of milk, but they shall be under the control of the boards of health appointing them, and shall perform such other duties as the said boards may designate. Their compensation shall be determined by the boards of health in cities, and by the selectmen in towns appointing them.

Section 2. The collectors of milk provided for by section fifty-two of chapter fifty-six of the Revised Laws shall hereafter be appointed by the board of health, or by the selectmen acting as such a board, in each city or town, and the said boards may also designate and employ any member of the board or any agent or employee thereof, to act as a collector of milk, and the collectors of milk so appointed or designated shall have the powers and perform the duties conferred or imposed by law upon the collectors of milk.

Section 3. Section fifty-three of said chapter which provides for the licensing of venders of milk in vehicles is

hereby amended by adding at the end thereof the following:—If the applicant for a license fails to comply with any regulation established by the board of health in the city or town where the application is made, a license may be refused until he has complied with such regulation; and a license granted under this section may be revoked at any time for failure to comply with any such regulation. If a license is refused or revoked under this provision, an appeal may be taken to the state board of health, whose decision shall be final and conclusive.

Section 4. So much of sections fifty-one and fifty-two of said chapter fifty-six as is inconsistent herewith is hereby repealed.

Section 5. This act shall take effect upon its passage; but inspectors and collectors of milk in office at the time of the passage of this act shall continue in office until their successors are appointed hereunder. Approved May 19, 1909.

GEORGE E. BOLLING, Chairman.
GEORGE L. TOBEY, M. D.
ELLIOTT WASHBURN, M. D.

The report of the committee was accepted and on motion of Dr. Durgin was continued for the ensuing year with the addition of two members to be appointed by the President. By vote of the Association, on motion of Dr. Durgin, the committee was instructed to draw up a milk regulation as a guide for such regulations by the boards of health of the State; a report on same to be made at the next meeting of the Association.

TYPHOID FEVER: INCIDENCE OF THE DISEASE AS CONTRACTED WITHIN THE MASSACHUSETTS GENERAL HOSPITAL FROM 1899 TO 1908.*

By LESLEY H. SPOONER, M. D.
Boston, Mass., formerly House Pupil at Mass. Gen. Hospital

That typhoid fever is a contagious disease has been known for a great many years, and the method of its transmission was indicated as early as 1856 by Budd of Bristol, who believed that in this disease the stools were the essential agents in the transmission of the infectious process.

Little real advance, however, could be made in the study of the disease and its prevention until its actual cause was discovered by Eberth in 1880. Since then the typhoid germ has been demonstrated in a number of other excretions besides the feces, notably in the urine, and to a lesser degree in the sputum.

In the efforts to prevent the further distribution of typhoid fever, it is but natural that general hospitals and other large institutions should be the first and foremost to make and carry out strictly regulations concerning disinfection, and a strong effort is made at the Massachusetts General Hospital to impress upon the house physicians, nurses, ward-tenders, in fact, any persons brought into any relation with typhoid patients, the necessity for the greatest care in order to prevent the extension of the disease.

* An investigation suggested by Mark W. Richardson, M. D., Secretary of the State Board of Health, and carried out with the hearty co-operation of the hospital authorities. Financial aid for the work has been furnished by Dr. Richardson, Mrs. Robert S. Bradley of Boston, and Mr. Frederic W. Lord of New York.

It is the purpose of this paper to point out that in spite of this careful instruction, given to people of intelligence above the average, the incidence of typhoid fever within the Massachusetts General Hospital during the past ten years has been far beyond what should properly have been expected. During the period of ten years, from 1899 to 1908, there were contracted within the hospital, apparently from direct or indirect contact, 27 cases of typhoid fever. Of this number, 19 were nurses; 4, ward tenders; 1, morgue tender; 1, kitchen hand; 1, laundress; 1, elevator man.

In order to arrive at the relative importance of these figures, it is, of course, essential to know how many individuals are, as a rule, employed in such an institution. This number naturally varies from time to time, but at present there are employed in the Massachusetts General Hospital about 200 persons, who might be said, in the broadest sense, to be exposed to the disease,—typhoid fever. This number may be divided as follows:

Nurses	119
Ward-tenders	19
Ward maids	18
Laundry men and maids	30
Ambulance men	3
Accident ward and pathological laboratory employees	7

Of these, only the nurses and ward-tenders and those employed in the laundry and pathological laboratory are, in the strictest sense, greatly exposed to typhoid fever. The number of those who might be exposed to the disease, therefore, would be, approximately, 168.

Furthermore, during the same ten-year period, the records show that there were brought to the hospital 12 nurses who had been engaged in outside practice, and who gave positive histories of having cared for, within a few weeks, patients sick with typhoid fever. It must be assumed that these nurses were thoroughly familiar with the procedures

necessary to prevent contamination, though it must be admitted that in private practice it is not so easy to carry them out as in a large hospital.

Of the 27 hospital cases, 6 proved to be "very severe" in character, and two died—both ward-tenders; two were "severe"; 12 ran an "average" but not dangerous course; and 7 were only "mildly" sick. Six cases were characterized by true relapses, and 4 had recrudescence of fever after an initial drop. There were 3 cases of phlebitis, 1 of severe bronchitis, and 1 of otitis media. Four cases had hemorrhages of considerable severity and 2 of these were fatal. In one of these hemorrhagic cases there was perforation of intestines also.

The occurrence of the disease by years was as follows:

1899	2 cases
1900	1 case
1901	2 cases
1902	3 cases
1903	2 cases
1904	6 cases
1905	2 cases
1906	2 cases
1907	3 cases
1908	4 cases

It is apparent that although the number of cases seen annually shows a moderate fluctuation, there has been no actual decrease in the number of cases.

Conclusions:

1. That in the Massachusetts General Hospital the annual incidence of typhoid fever contracted within the institution is high. During the past ten years this has averaged between 2 and 3 cases yearly That is to say, 1.6 per cent. of the nursing force; 2.1 per cent. ward-tenders; or, 1.6 per cent. of all those exposed to the disease have become infected.

2. That a similarly important incidence of the disease is to be noted among nurses engaged in private practice.

3. That the disease contracted under such conditions seems to run a course of more than ordinary severity, with a greater number of complications and with a high mortality.

4. That the disease among the hospital personnel is not diminishing in frequency.

PROTECTIVE INOCULATION AGAINST TYPHOID FEVER.

By MARK W. RICHARDSON, M. D.
Secretary State Board of Health, Boston

The facts, which you have just heard, in Dr. Spooner's paper are very striking, although they are not, of course, new. The danger of contact infection in typhoid fever has been recognized for many years, but it has been taught also that by the exercise of intelligence and special training the danger from this source could be practically eliminated.

Dr. Spooner's figures, therefore, give to the feeling of security with which we have been indulging ourselves a sudden and disagreeable jar. Inasmuch as careful teaching and special training have failed to eliminate the incidence of typhoid fever among those attendant upon the sick, it is apparent that recourse must be had to other methods, and the method which appeals most strongly to us at present is that of specific typhoid inoculation of those exposed or likely to be exposed to this disease.

This method, which has been tried out quite thoroughly in England and Germany in the effort to cut down the occurrence of typhoid fever among the governmental troops, and which is about to be used in the American army, consists in introducing into the human body, by subcutaneous inoculation, varying amounts of typhoid material in the shape of typhoid bacilli which have been devitalized by heat or otherwise. To this inoculation the body responds in a characteristic manner by the production of specific substances antagonistic to the typhiod organisms, so that when, later, the individual is exposed to infection, the body cells

and fluids respond in so sharp and efficient a manner that the infection is nipped in the bud, and does not gain a foothold.

The results in practice of specific inoculation for typhoid fever have been somewhat as follows:

Leishman (Journal Royal Army Medical Corps, Feb., 1909), in reporting the English experiences, states that of the 5,473 soldiers who had been inoculated only 21 became subsequently infected. Of these, two died. Of 6,610 uninoculated in the same regiment, 187 had typhoid, and 26 died.

In confirmation of these results, the Germans found that of 424 typhoids, 324 had not been inoculated. In the uninoculated, the mortality was 11.9 per cent.; of the inoculated, 4 per cent. In the inoculated, the disease was milder and there were fewer complications and relapses.

There being, then, this solid basis of experience to draw upon, it was natural to suggest this method of prevention to the nurses and house staff of the Massachusetts General Hospital. A meeting with them was arranged, therefore, and the situation fully explained by the writer. It was pointed out that according to all previous experience from 2 to 6 of their number were about to be subjected during the coming typhoid season to the dangers and inconveniences of typhoid fever. They were, therefore, urged to submit to typhoid inoculation, which would, assuredly, cause little discomfort and do no harm, and might be the means of saving them from sickness and, perhaps, death. As a result, over fifty nurses volunteered and are now in the process of systematic inoculation. The outcome of this method of prevention cannot, of course, be predicted, and in any event the matter must be viewed with great conservatism. Personally, I have no doubt that the method has a sound, scientific basis, and that time and experience will furnish the knowledge as to details necessary to make it practically effective.

Thus far in this work, very conservative lines have been followed. The goal aimed at has been a method which should accomplish the end desired with as little inconvenience as possible to the individual. We have, therefore, not followed the lead of Wright, the English exponent of this method, who gives two inoculations of very large doses of vaccine—doses, in fact, sufficiently strong to cause severe constitutional symptoms and to confine the individual, possibly, in bed for several days. On the contrary, we have used doses so small as to cause practically no disturbance except a slight local tenderness. Our practice at present is to give four such inoculations (50,000,000 to 100,000,000 in each dose) at five-day intervals. It is hoped that in this way the immunity secured may be sufficient, and that the general introduction of the method may not be prejudiced by the severity of the reactions produced.

In this connection it is interesting to note that two inoculations given to each of five individuals produced in their blood agglutinating powers ranging anywhere from 1 to 100 up to 1 to 1,000, the latter figure being one very rarely seen in the presence of actual typhoid fever. Of course, a high agglutinating power of the blood does not necessarily mean a correspondingly high immunity of the individual, but these results obtained from such small doses of vaccine are certainly very suggestive.

A point of great interest and importance is, of course, the length of time during which this immunity, artificially acquired, may be supposed to last. English writers think that the immunity lasts from two to three years. This is a point, however, upon which no authoritative statements can yet be made.

As has been stated, the method pursued up to this time has been that of subcutaneous inoculation. There are, however, facts which lead me to believe that the subcutaneous method may in the future be replaced by the administration of these typhoid vaccines by mouth. A number of inves-

tigators have shown that with typhoid bacilli, and some other bacteria, a considerable amount of immunity may be produced by the administration of dead germs by mouth. If it should prove that this method is effective, the advantage gained would be two-fold at least. In the first place, the local tenderness after inoculation, slight though it be, would be eliminated, and, secondly, we might hope to get an increased local intestinal immunity. That is to say, the intestinal mucus membrane, being acted upon directly by the vaccine, should become more strongly resistant than would be probable as a result of indirect subcutaneous inoculation.

The result should be, under such circumstances, that any living typhoid bacilli taken in through the alimentary tract would find an impassable barrier in the now strongly fortified intestinal cells.

Granted that this method of immunization is an efficient one, it is easy to see that the extent of its usefulness will be very wide, for there can be no doubt that the same principles of protective influence will apply in other intestinal diseases, such as cholera, dysentery and other diarrhoeal affections.

The problem, therefore, at present, is to demonstrate the value of these methods in large bodies of individuals, such as army troops and hospital nurses. The method should be applicable, in fact, it has been used, with success in large institutions, such as insane asylums, in which typhoid fever has broken out.

Finally, I have not the slightest doubt that, within a few years, protective inoculation will be resorted to in any community in which the disease becomes epidemic. In fact, I believe that any of you, gentlemen, in your capacity as protectors of the public health, would be justified, in the presence of an epidemic of typhoid fever, in recommending and urging upon the people of your constituency the use of such specific inoculation.

THE PRESIDENT. I think this Association will agree with me that there is no subject that comes closer to the powers of the boards of health, state and municipal, than the questions raised by the papers that have been read to you this afternoon. A great many of us know what the difficulties are of a quarantine against a case of diphtheria with persistent organisms in the throat, but what comparison is to be drawn between that case,—a case of obstinate diphtheria infection,—and such cases as have become familiar of late years in typhoid fever? Can you tell us something, Dr. Swartz, about the responsibilities of a state board of health in matters of this sort.

DR. SWARTS. I don't know that I can handle the subject as it should be handled; but it evidently is a question which state boards of health should try to control by knowing of the possibilities of the transmission of the disease. Referring to the first paper, it would seem almost impossible that the disease should exist as it has in an institution of that kind. We can understand that ward tenders might be careless, but if nurses, who are constantly taught that this particular means of infection is from fecal material, are careless, it would seem as if the screws were loose somewhere. Of course we have to take into consideration the individuality of the people who are handling the patients, and their general carelessness. That it would occur perhaps more readily with the outdoor nurses, spoken of in the first paper, I am not surprised. In a family where there is a lack of convenience for caring for the sick, and a lack of responsibiltiy on the individual, the family being by themselves, having no internes, and no visiting physicians over them, it would seem as if there might be more carelessness. But knowing the disease, what it is, where it comes from, it would seem as if we might readily avoid infection from typhoid fever.

And as to the inoculation principle, I think it would be

a difficult matter, perhaps, to introduce it in general, owing to the lack of confidence which the public may have in the germ theory even at the present time. To ask them to have something introduced into their system, even if they belonged to the army, seems like asking a good deal of them. We have come to the stage of believing that vaccination against smallpox is a perfect thing. We could do the same thing with this. But to work it out at the present time in cold blood, without these figures and statistics, I think would be a difficult matter for boards of health to have any influence whatever. The subject of this second paper is one which has been brought out more recently, with a great deal more interest, and I think will attract more attention as the time goes on. I am very glad to hear that the inoculations have been introduced in the hospital, and that the attendants are willing to submit to the test. It is best to wait for a few years and see whether these statistics continue or not.

THE PRESIDENT. It is always a great advantage for the public health authorities to submit to the criticism of the large practitioners of medicine, who have other views naturally on some subjects than those which are entertained by local boards of health. We have one of our friends here, who not only has that knowledge, but who also had in his day a large institutional experience. I will ask Dr. Stevens to say something on the subject.

DR. STEVENS. There is one question that I should like to ask Dr. Spooner, that is, whether he has any notes showing whether the nurses who were attacked with typhoid fever were day or night nurses.

DR. SPOONER: No, I haven't any.

DR. STEVENS: I have been conected with the Cambridge Hospital for a great many years and we have found that nurses doing night duty have given us the greatest

number of our cases. In having a larger number of patients to care for they are not as careful about the bedpans, etc., and this explains a greater liability to contagion from the disease. This seems to me an important thing and emphasizes the necessity of nurses being warned of the danger they run in caring for these cases if they are not careful. The idea of inoculation is an entirely new one to me. I know very little about it, but it appeals to me and I think it is a thing of great importance. I believe it could be used in towns where epidemics exist to very great advantage.

Last year in the town of Madison, Maine, there was an epidemic of typhoid fever. This is a town of four thousand inhabitants. At the time of the breaking out of the fever the greater part of the people were using river water. There were about two hundred cases in all. In this section of the country typhoid fever was hardly ever known before. Other towns on the river below Madison where the river water was used had more or less cases but stringent measures were taken in the way of boiling water, and I believe this precaution prevented an epidemic in these towns.

MR. COFFEY. Mr. Chairman, a thought occured to me while listening to Dr. Richardson. Health officers of course are likely at any time to be brought up against such a case as New York has had,—a woman known as "Typhoid Mary," whom they have been obliged to quarantine and isolate on North Brothers Island for the past two years. Has this vaccine been tried upon these carrier cases anywhere with any effect?

DR. RICHARDSON. It has been tried in Germany, I think, once or twice, but the results have not been especially encouraging thus far.

DR. SPOONER. Mr. Chairman, I would say, in answering Dr. Stevens, that it is generally impossible to tell from the records what time a nurse has been on service, whether she has been a day or night nurse; but it is of interest to know that more cases are contracted by nurses in the female wards, where they have to attend to the bed pans and the urinals of the patients, than in the male wards, where such duties are carried out by the ward tenders.

DR. CHAPIN, (Providence.) This is a subject in which I am very much interested. Dr. Richardson's paper was particularly encouraging. We are all glad to hear the exact figures given, which show the success of this experiment in preventive inoculation. It was entirely new to me that there is prospect that the vaccine may be given by mouth. I think that if it should prove to be a successful method of administration it will be a very great help to health officers. Human beings are willing to take anything in the mouth, but they are very particular as to what is put under the skin, and I am sure that we could apply vaccine by mouth much more successfully than we could by means of a hypodermic needle.

Dr. Spooner called attention to a mode of infection in typhoid fever which has for some years seemed to me to be by all odds the most important mode of infection, that is, direct contact between the person who harbors the germs and the one who contracts the disease. I suppose that in all the cases he speaks of, the infection was transmitted in this way. We are, however, apt to consider other modes of infection as being far more important. There is much talk about infection by water, by milk, by oysters, and of late years of infection by means of flies. There is no doubt that these modes are important in some places, and at times they are of overwhelming importance, causing extension epidemics, but a large majority of communities have typhoid year after year without

having any great outbreaks. The important question is, how are these inter-epidemic cases of typhoid fever acquired?

I have recently attempted to analyze in a rough sort of way the source of the typhoid fever in Providence. During the last twenty-four years we have had about 4,200 cases of typhoid fever. About 340 of them, or 8 per cent. were due to infection of the public water supply. Perhaps an epidemic of about 80 cases in November and December 1895 was due to water, making in all 10 per cent. This of course, ought not to be allowed in any municipality, and I think we have done away with the danger of it in Providence by means of filtration. Ten per cent. then of our cases we may assume were due to infection of the public water supply. We have had a number of milk outbreaks in Providence, some nine outbreaks in the last 24 years, and the number of cases due to that cause is about the same as that due to water, about 340 or 8 per cent. I mistrust that this percentage is rather larger than occurs in most cities. Most of these milk outbreaks have been in the last two or three years. It may be that we may not have any more for several years, so that our percentage will be lower. I mistrust that probably throughout New England not over five per cent. of our cases of typhoid fever are due to infection by milk.

A great deal has been said about the relation of flies to typhoid fever, and it has been held by some that a large part of our typhoid fever is due to flies. In fact, some writers would lead one to think that the chief source of typhoid fever is the house fly. Let us examine the bearing of the Providence figures on this question. We have the autumnal increase in typhoid fever, just as we have in all cities. I find that with us the excess of autumnal typhoid fever over the rest of the year, running from the 1st of August up to December, is only about 25 per cent. of the total number of typhoid cases. If typhoid fever is due to

flies we must look for the cases attributable to flies in this 25 percent, but it seems to me unreasonable to assume that the whole of this 25 per cent. is due to the fly. Certainly a considerable amount of it is due to cases contracted outside of the city, or what is called vacation typhoid. We find in Providence that about 10 per cent. of all our cases are contracted outside of the city. Most of these occur during this period, so that our 25 per cent possibly due to flies, must be reduced by perhaps 5 per cent. But this 20 per cent. autumnal excess, as I told you, runs from August to December. We can hardly think that many cases of typhoid fever contracted after the first of November are due to flies, yet the large part of the excess is in November. If that excess is not due to flies why should we assume that all the rest of it is? I do not for a moment doubt that flies are a source of typhoid fever in military camps and similar places, where there are enormous swarms of flies and where there is a great carelessness in the disposal of excreta. They may under such circumstances be by far the most important source of typhoid fever. But in well sewered cities like Providence, Boston and Worcester, I doubt if they play a very important part in the spread of the disease.

This leaves us with the source of some 50 or 60 per cent. of our typhoid fever unexplained. What is it's cause? I believe it is due in the great majority of cases, to that form of infection which Dr. Spooner has told us about; to contact infection, by which is meant fairly direct contact with some person harboring the germs. A few years ago we would have considered this idea untenable, and we would have said, "Cases of typhoid fever are reported in this house and that house where there has been no typhoid fever, the patients have not in any way been exposed to a case of typhoid fever;" but now we know very well that they do not have to be exposed to a *case of sickness*, they may be exposed to a "carrier," a perfectly well person who

is harboring the germs of disease. The question of the greatest practical importance is how numerous are these chronic carriers of typhoid germs? It has been said by a number of German observers that probably three per cent. of the typhoid cases become chronic carriers. I am inclined to think that the number is considerably greater than that. I think so because so far as I can learn, though most of the reports are not very definite on that subject most of the searchers for the carriers have only made one, or perhaps two examinations of the faeces. Now it has been shown that a chronic carrier may go for weeks without showing any germs in the faeces, so that it is very easy to overlook such, in making a series of bacteriological examinations. But allowing that only 3 per cent. of the cases of typhoid fever become chronic carriers, the number must in the aggregate be very great.

If one turns to the last report of the census bureau on mortality statistics it will be found that in the registration area of the Unied States there were 12,000 deaths from typhoid fever in the year of 1907. The registration area includes about one half of the United States, the half with the least typhoid. 25,000 deaths from typhoid fever in the United States in one year! What is the fatality of this disease? Perhaps 10 per cent. I am inclined to think that it is really much less than that, but we will call it 10 per cent. How many cases do the 25,000 deaths represent? 250,000. Now 3 per cent. of that is 7,500 and we may be sure that this number of chronic carriers is added to the carrier population of the United States every year. Certainly there are a vast number of people who are foci of typhoid infection, and who unknown, are mingling freely with the public everywhere, and there is ample opportunity for them to spread the disease by contact, and to produce at least fifty per cent of the typhoid fever which is reported to us each year.

I cannot understand why the board of health of New

York City should isolate and virtually imprison "Typhoid Mary," and I cannot understand how the courts can support the procedure. If there are thousands, and there must be thousands and tens of thousands, of chronic carriers of typhoid fever in the United States today, it seems to me a great outrage to shut up the one particular woman that has had the misfortune to be discovered. The others we do not know about, or at least most of them we do not know about, and they are mingling freely with the public. Only a few of the carriers can possibly be discovered and if all could be discovered they could not possibly be isolated. The unknown carriers are the ones that are doing the harm. It can accomplish no good, and it is a great injustice, when we do discover a few, to attempt to isolate them for a life time, or to make them submit as an alternative, to an operation for the removal of the gall bladder.

THE PRESIDENT. I think the doctor is quite right, it does seem to me the most serious interference that has ever been attempted with personal liberty. I don't know but it is all right, but it is pretty serious business. Fortunately the Association has as its guest this afternoon a gentleman who comes from New York, and I think we will try to hold him to a certain amount of responsibility. Dr. Cole, we should like to hear what you have to say about all this.

DR. HILLS COLE, of New York. Mr. President, while a resident of New York City I am not a representative of the New York City Department of Health, but of the State Department of Health, so that I decline to be held responsible for the militant methods that the New York City Board of Health uses. Certainly we have the most autocratic government down there that I think is known probably in this country, or most anywhere. Talk about the militarism of Europe and Germany, I think that in the New York City Department of Health they exercise author-

ity in a way that is—well, I won't say unwarranted, but they certainly do do excellent work as a result of it. (Laughter.) Certainly if ever the result justified the means I think they are justified in New York City, because that is a community that we are very proud of and that we point to with a good deal of pride. In our New York State Department of Health we not not have much to do with our great big child in New York City. We think we are doing pretty well if we can get the other communities of the state to half way live up to the excellent work that is being done there.

The remarks of the first speaker about the incidence of typhoid in large hospitals is a somewhat new idea to me. I should very much like to see the reports of other institutions, to see if they run *pari passu* with it. I had hardly thought that in this day and age we could run across such statistics as those in hospitals which are supposed to be at the top notch of excellence.

As to the immunity coming from the typhoid injections, practically with vaccines, that is certainly a very interesting department, and I am with Dr. Chapin entirely in looking forward with hope to the question of the immunization by the mouth.

It undoubtedly is going to be of great help to public health workers if it ever becomes an established fact that we can produce immunization just as readily by taking the various vaccines by the mouth as by injecting them. It may be true of all types of vaccination, just as much smallpox as anything else. We have in New York State smallpox in our outlying districts, country districts, amongst the lumbermen in the north and amongst the negroes down in the Hudson valley, laboring in the brickyards,—and if we could only generalize vaccination still more than we do we should undoubtedly eradicate it. The great prejudice against it is this skin inoculation. If it is possible that we can get to a type of immunization by taking something by the

mouth, we shall certainly disarm a great part of the prejudice of the people. I believe they are working along that line amongst a certain section of the medical profession in Iowa. They are there attempting to immunize against smallpox by taking a preparation by the mouth, and I believe the Legislature there and the State Board of Health of Iowa have been obliged to rule that vaccination would cover immunization by taking by the mouth as well as by scarification.

DR. RICHARDSON. Mr. Chairman, I should like to say about immunization by the way of the mouth, that, as far as the present experiments go, such immunization is not so effective as that produced by the subcutaneous method. It is to be hoped, however, that future investigations will bring about an improvement in this respect. As I said, the United States Army authorities advocate this method, and Dr. Spooner has just received a request, he says, from the Marine Hospital to go over to Chelsea and immunize the hospital ward tenders, who will care for the large number of typhoids just received from the battleships. It is also said the Professor Barker of Johns Hopkins, just before he went to Europe this last summer, submitted to inoculation in view of the fact that he might possibly be exposed to infection while abroad.

DR. SWARTS. Mr. President, in connection with the statistics presented by Dr. Chapin there occurs to me a recent investigation made in the District of Columbia by the Public Health and Marine Hospital service, with its full corps of investigators and plenty of money to work with. They investigated the typhoid epidemics that they had had there, and they found that in 45 per cent. of them it was impossible to find any causation whatever, any association with infection in any way. The contacts were, I think, about 15 per cent., and the milk about 10. It really ap-

peared to throw discredit upon the water supply of the District of Columbia, or the city of Washington, although the water was thoroughly filtered. But considering the fact that they cannot find, with all their ability and all their investigation, the causation of this disease in 45 per cent. right in a district that they have full control of, I think we as health officers can feel contented if we do not find the causation in every case in every house we go to, although we are expected to do it, and a great deal more is expected of us, perhaps, by those who employ us.

DR. DURGIN. I have been asked to say something about the epidemic which occurred in Boston last year. I don't think there is very much to say of it apropos of the paper and the discussion, except that it added very largely to our percentage of cases which come from milk. We have had several small outbreaks in Boston in the last few years directly traced to milk. This one in particular gave us something more than 400 cases, and it occurred at the hands of two milkmen, one of whom handled the milk of the other as well as his own, while suffering from typhoid fever. It was one of those ambulating cases, and no one knew anything of its existence until he fell sick nearly two weeks after he became ill with the disease. This case was autopsied, and it was seen clearly how far back his disease began. In this instance the immunization, in question today, had it been known and endorsed, could have been utilized. One case was traced back to the 31st of March, and one case occurred on the 1st of April, two on the second, one on the 3rd and then it became violent with a large number each day. I would say that on the second of April we practically knew that the epidemic was due to milk, and on the third of April, the facts were sufficiently assured so that we could have utilized this immunization at once.

DR. PIERCE. You mean you could have vaccinated the takers of that milk?

DR. DURGIN. We could have given the immunization on April 3rd, within 24 hours after the first two or three cases occurred and were known to the Board of Health.

DR. DENNY. Following out Dr. Durgin's suggestion of giving immunizing doses to individuals who have been exposed, I should like to ask Dr. Richardson whether the inoculations would be of use after a person was already infected.

DR. RICHARDSON. I have had a small amount of experience in the treatment of typhoid fever with these same vaccines. This experience touches between thirty and forty cases. Some of these cases have been quite far advanced in the disease; others have been earlier. I could not come to any very definite conclusions except in this way. It seemed to me that cases which were taken early were favorably affected by the vaccine, whereas, if the disease were already very markedly advanced, the effect was not so marked, and this is what one would naturally expect under the circumstances. My feeling, therefore, would be that the effect of the vaccine would vary according to the time at which it was used. The earlier the inauguration of the treatment the more hope there would be of its having favorable effect.

DR. DENNY. Before the appearance of symptoms?

DR. RICHARDSON. Before the appearance of symptoms if possible. I have never had any such cases, but my feeling would be that inoculation in such cases would prevent the disease absolutely or it would be much milder.

MR. COFFEY. Where is this vaccine to be obtained? Is it a commercial product, on sale?

DR. RICHARDSON. The vaccines that we are using we make ourselves, but they can be procured from at least one of the large manufacturing druggists.

DR. HOLDEN. Mr. President, I had an experience some 20 years ago with an infection that is worthy of note. In a little village of perhaps 1,500 people we had a water infection. Nearly the whole village used the water supply. We found very soon that every case could be traced to individuals using the water either in their homes or where they were employed. We could definitely place the infection of the water supply at the first of March, because that was the first day in that village when from the thawing of the ice and snow water began to run. We could definitely place our first cases of infection at about the 10th of March. From the period beginning about the 10th of March to the middle of April, a very large number of the total cases occurred. Practically at this time the new cases, the original cases, ceased. In August we began to get what we called secondary cases, and I suppose they were from 30 to 40 in number. It has seemed to me in listening to this discussion that if there was danger from carriers we would have had in that little community a much larger number of cases. Personally I attributed the incidence of typhoid coming on in August and continuing for about six weeks or two months to the flies. I can't conceive how, if there are any considerable number of carriers, 3 per cent. as stated, and this number is increasing year by year, we would not soon be overwhelmed with typhoid fever.

DR. EMERSON. One thing ought to be considered in any case where there is an epidemic of typhoid, or where the disease is prevalent, in addition to the convalescent

cases which may be carriers. It seems to me there is an indeterminate amount of danger from persons who have not had the disease, but who may have been infected, and I think it has been proven that such persons may discharge the organisms in their feces, and if that is the case of course we have a very doubtful and indeterminate number of people who may be distributing the disease, and who may act as foci from which others may contract the disease. Of course if that is the case it might explain in part this large percentage of cases which we are unable to trace in almost all epidemics.

DR. BROUGH. Dr. Cole made the remark that in Iowa they regarded vaccination by the mouth as equivalent to vaccination by the arm. That method, in my opinion, is of no use. In this city at the time of an outbreak of smallpox that method was carried on at one of the hospitals here. There was one particular instance where the inoculation by the mouth was tried and proved to be absolutely inefficient. The patient contracted smallpox, and had a very severe case. Vaccination by the mouth was of no effect at all. I think that for any state to offer vaccination by the mouth as an equivalent to vaccination by the arm is entirely wrong, and I think it is not a scientific or a practical way of vaccinating.

As regards typhoid cases in the hospital, I had at one time to look up some statistics in the city, and I found that in almost all the hospitals in the city the nurses and ward masters were more susceptible to the disease than others in the community. Some of the hospital superintendents objected to having the fact brought out, or saying the disease was contracted in the hospital. They said the disease might have been contracted outside, because their hospital was very particular, the nurses were very particular in regard to their hands, and with a good corps of physicians, it was utterly impossible for them to get the disease in the

hospital. Nevertheless I think that it must have been contracted in the hospital, because it was prevalent in all hospitals,—there was no exceptions. At almost any of the large hospitals, especially where they have typhoid fever, you always find a certain number of the nurses, and occasionally some of the house physicians, though not often, and the ward masters, who get the disease.

If you can eliminate all danger from personal infection the dangers from the other sources will be very slight. Perhaps in the aggregate a larger number of cases are due to personal infection than are due to milk or water in the ordinary eastern cities, where they have good water supply. I think that that question of personal infection is the great one to be considered in almost all cases of typhoid.

DR. RICHARDSON. There is one point I should like to make in this connection, and that is that the incidence of typhoid in a hospital must not necessarily be taken as an indictment of the whole nursing staff, because the whole number of nurses may be at the mercy of some single individual who is careless. It is perfectly possible, for instance, that one nurse who is careless, may get some urine on her hands. She then takes the bed pan to the bathroom grasping the door knob with her unclean hands as she goes in. As a result everybody else who goes through that door becomes subject to infection.

DR. DENNY. Mr President, I think there is one other conclusion to be drawn from Dr. Spooner's paper, and that is the importance of segregating typhoid fever patients in a general hospital. Even if they are not put in separate wards, they may be grouped together on one side of a ward and put in the care of nurses who are attending only typhoid patients. If this were done fewer of these cases would arise. I think a nurse who is taking care of typhoid fever patients only would be much more particular than

where she has one typhoid patient and five or six other patients that are not typhoid. The segregation of typhoid patients is carried out in almost all the German hospitals.

DR. CHASE. Mr. Chairman, may I ask through you two questions of Dr. Richardson? One is, is the medical profession doing its full duty in its efforts to prevent the spread of typhoid, in the way of giving urotropin or some similar drug to convalescents from typhoid? And the other question is: I understand that the Health Department of Boston is going to examine bacteriologically the throats and noses of the children in four schools in the Brighton district during the summer, or early in September, to see how many of them are carriers of diphtheria. Would it be practicable to institute a somewhat similar examination where there is an outbreak of typhoid, and find out who is who in the matter of being carriers of typhoid? Would that be practicable?

DR. RICHARDSON. As regards urotropin, I cannot say, of course, how much this drug is used in private practice. As far as the Massachusetts General Hospital is concerned urotropin is given as routine throughout the disease, and I feel certain that its use has been the means of eliminating many of the urinary infections. As to the examination of a large number of people for the discovery of carriers, of course that is possible, but the examination of stools is not an easy matter, and it is something which should not be undertaken wholesale unless there is a very good reason for it. (Adjourned).

THE CONVEYANCE OF BACTERIA BY SEWER AIR.*

By PROF. C-E. A. WINSLOW
Mass. Institute of Technology, Boston, Mass.

In 1858, when the causes of epidemic disease were still shrouded in profound mystery, an able and distinguished English sanitarian, Charles Murchison, brought forward what he held to be conclusive evidence that typhoid fever was "produced by emanations from decaying organic matter." While this pythogenic theory of disease reigned it was natural that all sorts of deadly maladies should be supposed to spring from organic wastes, and to pass into the air with the odors of decay. Sewer gas in particular became an epitome of all unknown and subtle miasmatic influences. Twenty-five years ago such passages as the following abounded in medical and sanitary literature.

"If we look for the cause of the large mortality from zymotic diseases in our cities, we find it principally in sewer-gas poisoning. Other causes operate to swell the total, but to bad plumbing we may attribute the prevalence of pythogenic pneumonia, peritonitis, inflammatory rheumatism, typhoid and malarial fevers, croup, diphtheria, and many kindred diseases."

As the germ theory of disease was gradually established, —as it was proved that the contagious and infectious maladies were due to the presence of microscopic plant and animal parasites,—the case against sewer gas seemed less

*Read at the Oct., '08, meeting of the Mass. Association of Boards of Health. Withheld from publication until released by the National Association of Master Plumbers, for whom the work was done.

convincing. Organic emanations might favor the development of such diseases by lowering vital resistance; but they could not cause them. If sewer air were directly responsible for infectious disease, it could only be by the conveyance of living germs. Experimental bacteriology was therefore called in to determine whether this was possible and to what extent it actually occurred.

Nägeli and many other bacteriologists showed that under ordinary conditions germs adhere strongly to moist surfaces and are not easily given off from liquids into the adjacent air. On the other hand Sir Edward Frankland in England and Raphael Pumpelly and A. C. Abbott in this country carried out experiments which indicated that chemicals in solution and bacteria in suspension might be thrown into the air from liquids by the bursting of bubbles. On this contingency the possible danger of sewer gas infection rested; but it was still a question whether this danger was an important one. Actual examinations of the air in sewers by Miquel in France, Petri in Germany, and Carnelley and Haldane, Robertson and Laws and Andrewes in England showed that sewer air as a matter of fact contains very small numbers of bacteria and those of types common in street air rather than in sewage. Uffelmann found the same condition in the air of a house drainage system. Carnelley and Haldane and Laws and Andrewes isolated sewage bacteria in the immediate vicinity of points where active splashing occurred. As in the experimental studies of Frankland, Pumpelly and Abbott, there was clearly a possibility of air infection where spray was produced by some mechanical means. On the whole however the air of drains and sewers seemed to be of high bacterial purity, and all the observers who studied normal conditions in actual sewers concluded that the danger of bacterial infection from sewer air was remote.

These results, with the absence of any reliable evidence from the study of epidemics in favor of the transmission of germs by sewer air, have led sanitarians in Germany and

the United States to agree with practical unanimity that the danger of such transmission may be disregarded. In England, on the other hand, a large number, probably a majority, of sanitary experts have failed to be convinced, and have clung to the opinion that under some conditions the carriage of disease bacteria by sewer air is a practical possibility.

A little over a year ago, at the request of the National Association of Master Plumbers, I made some experiments on this problem, upon which no new investigations had been conducted for over ten years. I used an experimental stack of four-inch soil pipe, fifteen feet in height, with a running trap at the bottom and an exhaust fan, for drawing up a strong current of air, at the top. Sewage was placed in the trap, sealing it partially or completely, or resting in the bottom without sealing it. Air was drawn over the sewage and wetted surfaces of the pipe or was bubbled thru the sealed trap, and the air was examined at various points in the stack above. When the trap was partially sealed by pouring in a liter and a half of sewage and air was drawn thru the seal by a suction corresponding to an air flow of 620 feet per minute, the normal number of bacteria in the pipe (one or two per liter) was increased to 18 two feet above the trap, 14 seven feet above and 5 twelve feet above the trap. In another similar test sewage streptococci appeared at points, two feet and seventeen feet above the trap. Lower rates of suction, corresponding to an air flow of 490 feet per minute failed to show any increase in the bacterial content of the pipe air. When air was drawn at various rates over the surface of one liter of sewage in the (unsealed) trap no increase of bacteria could be demonstrated in the air. Finally in another series of tests the lower two and a half feet of the stack were thoroly wetted and air was drawn over this wetted surface. In one case, with an air current of 790 feet per minute, there was a slight increase in the bacterial contents of the pipe air (five bacteria per liter at a point twelve feet above). As a general result of these

investigations I reported to the Association of Master Plumbers that very strong currents of air could detach bacteria from sewage so as to cause an appreciable increase in the bacterial content of the air above, but that moderate currents, such as would be created under natural conditions, apparently failed to do so. Even under extreme conditions, the contamination of the drain air was slight. Only three of the characteristic bacteria of sewage were isolated from the air in the whole series of experiments. As a result of this investigation I concluded that the danger of bacterial infection from drain air was but slight.

At about the same time a series of experiments on sewer air was reported to the Royal Society of London by Major W. H. Horrocks of the English Army Medical Corps.* His results appeared at first sight to warrant widely different conclusions from those drawn by other observers; and it seemed necessary to re-examine the whole question with the greatest care.

Major Horrocks' general method consisted in the artificial infection of the lower part of natural and experimental drainage systems with a peculiar bacterium, the *Bacillus prodigiosus*, which is not normally found in the air. He then exposed small open dishes of nutritive media in the upper part of the systems; and among the colonies which developed on these plates he identified the particular form, *B. prodigiosus*, introduced in the liquid at the bottom. By this process he detected his test organism in a pipe 9 feet above an experimental running trap into which it had been introduced, and in the air of a catch basin of the town, into which he had poured it. Similar results were obtained when the lower sections of his experimental pipe system were wetted with a culture of the *B. prodigiosus* and then dried. The dried germs were apparently detached, carried up by the

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*Proceedings of the Royal Society, Series B, LXXIX., No. B 531, p. 255.

air and deposited on the plates above. In another series of experiments sewage infected with the typhoid bacillus or with *B. prodigiosus* was allowed to flow, quietly and without splashing, thru a horizontal pipe to which a vertical pipe was connected at an intermediate point. Plates exposed in the vertical pipe showed colonies of the specific bacteria introduced even at a height of eleven feet and nine inches above the liquid. Emulsions of *B. prodigiosus* were flushed from the closets of drainage systems in actual use and the germs thus introduced were found in all parts of the systems in open connection therewith, even at a height of fifty feet above the traps. Major Horrocks, by the same method of exposing Petri plates, found *Bacillus coli*, the characteristic organism of sewage, in a house drain and in the main sewer of the town. Finally he passed the feces of a typhoid patient suspended in water thru a half-S trap and found the typhoid organism on plates in a vertical pipe above at a height of three feet six inches from the liquid.

Major Horrocks' report, coming from an authority of such eminence, naturally excited the deepest interest among sanitarians. In many quarters the old suspicions of sewer air were revived with almost their full force. The Journal of the American Medical Association, for example, said in commenting upon Horrocks' work, "The sewer peril therefore still exists, and disconnecting traps are sanitary necessities. It is possible that we may still have to look to sewer emanations as the occasional cause of mysterious outbreaks of disease. Air-borne typhoid is a reality under other conditions, and apparently we shall have to recognize a possibility, tho perhaps a remote one, of its conveyance by the old-fashioned sewer gas."

In the Illinois State Board of Health Bulletin for May-June, 1907, the results of Major Horrocks were cited in defense of the statement made in a previous bulletin that "There is no doubt, also, that sewer gas is a carrier of diphtheretic poison, and that many outbreaks hence hold close

relationship with defective drainage, sewers and cesspools," a statement which was made the subject of just editorial criticism in the Journal of this Association for February and August, 1907.

Other sanitarians, including those of the highest competency, maintained a more conservative attitude, and awaited further evidence before abandoning the conclusions indicated by that previously accumulated. The matter stood about as follows. On the one hand Horrocks had shown that specific bacteria, present in traps and drains, could get into the air above by splashing, by the bursting of bubbles and even in some experiments from the surface of liquids apparently in quiet motion; he detected such bacteria by the plate method in the air of ventilating pipes at considerable distances (once at fifty feet) above the infected liquid. On the other hand, Miquel, Petri, Uffelmann, Carnelley and Haldane, Laws and Andrewes and others had shown that the number of bacteria present in the air of sewers and house drains is extremely small, and that those present are generally air forms and not sewage forms. Furthermore reliable evidence of the spread of infectious disease by sewer air is wholly lacking. The inconsistency of the two sorts of evidence required explanation; and after presenting the facts to the Sanitary Committee of the National Association of Master Plumbers, I was commissioned by them to attempt the clearing up of the apparent contradiction.

I first attemped to repeat Major Horrocks' own experiments as closely as possible. I examined the air of a boat chamber on one of the main sewers of the City of Boston, as Horrocks had done in the sewers of Gibraltar. I found colon bacilli on my plates in many experiments; but their number was small near the sewage, greater near the street, and greatest in the street air itself. It was clear that they came from street dust infected by horse dung, etc., and not from the sewage at all. I then constructed an experimental pipe system, such as Horrocks used, consisting of a half-S

trap of 6 inch tile drain to which an eight foot vertical stack of the same pipe was connected. A rich emulsion of *B. prodigiosus* culture or of *B. coli* culture or of feces in soapy water was poured thru the trap and Petri dishes of nutrient gelatin or agar were suspended at various points in the pipe above. Control plates were also exposed at various points (nine in all) in the laboratory outside; none of these control plates ever showed the specific organisms. Two tests with feces failed to show *B. coli* in the pipe, and three tests with an emulsion of *B coli* also gave negative results. In two other tests *B. coli* colonies appeared on the plates; in one case three colonies two feet above the liquid, two colonies four feet above and one colony eight feet above; in the other case, five colonies two feet above, two colonies four feet above and a single colony six feet above. Six tests were made with *B. prodigiosus.* Three were negative. In one case a single colony appeared two feet above, and another six feet above. In a second case three colonies appeared two feet above and one eight feet above. In the third case there were six colonies two feet above, three four feet above, one six feet above and one eight feet above. Altogether six out of 28 plates exposed in the pipe above emulsions of *B. coli* or feces showed colonies of this germ, eight colonies at two feet, four at four feet and one each at six and eight feet. Eight out of 24 plates exposed in the pipe over the *B. prodigiosus* emulsion showed the specific organism, ten colonies at two feet three at four feet, two each at six and eight feet.

Granting that bacteria may be discharged from the surface of a foaming liquid into the air above, it seemed *à priori* probable that even slight currents would transport them to considerable distances. It is clear that bacteria should be carried upward thru a pipe by a current of velocity just exceeding the rate at which they would fall in quiet air. The falling of small bodies takes place according to a physical formula, known as Stokes' law which for a sphere of radius

.0001 cm and a density near one gives a rate of .012 cm per second or 17 inches per hour. Theoretically bacteria should fall in quiet air at about this rate and should be transported by currents in excess of it. I made a few tests of this point by spraying cultures of *B. prodigiosus* into a chamber with an atomizer and drawing air over into a culture bottle thru a tube of known diameter and at a known rate. The slowest currents tested (72 inches per hour), carried the bacteria over in large numbers.

The general result of the experiments, so far, was to confirm the main contention of Major Horrocks,—that specific bacteria may be ejected from a foaming soapy sewage into the air above, and once in the air may be carried to considerable distances. The proportion of positiv results obtained was small however. With an exposure of two hours over a soapy liquid richly inoculated with artificial cultures, a total of 31 specific bacteria were isolated from 52 plates. The question at once suggested itself whether the whole question at issue might not be a quantitative one. Horrocks, by exposing plates over infected sewage found that some of the bacteria present could be isolated from the air. Other observers who had examined sewer and drain air under natural conditions by quantitativ methods had failed to find sewage bacteria in appreciable numbers. It might be possible that a few bacteria do get into the air above foaming sewage; but that their number is so small as not to affect the bacterial content of the air as a whole, as determined by ordinary quantitativ methods.

I next therefor attempted to investigate the question from this standpoint; and made first a careful examination of the best available quantitativ methods. Horrocks' procedure of exposing open dishes of nutrient media to the air is of course not quantitativ at all, since the bacteria which happen to fall on the plate are not related to any particular volume of air. The method adopted by most recent observers, and the one which I used in my first experiments in-

volves the straining out of the bacteria in the air by drawing it thru a sand filter. The bacteria are then washed out from the sand in steril water and enumerated by the ordinary cultivation methods. During my work this year I developed a new method* in which a measured volume of air is drawn into two large Culture Bottles and the bacteria are allowed to settle out and form colonies on nutrient media in the bottom of the bottles. This method, altho cumbrous, avoids all danger of losing bacteria by drawing them thru the sand and was used in all my later work. A careful series of comparativ tests showed however that the error involved in the sand method used in other investigations is not serious, and the earlier results may be accepted as correct in their general conclusions.

By the use of the Culture Bottle Method I attempted to control Major Horrocks' results from the quantitativ standpoint. I prepared a rich emultion of *B. prodigiosus*, containing hundreds of millions of bacteria per liter, (230 million to 5 billion), made it foam freely by beating it up with soap, and poured it into a large glass bottle or into an open dish. The air in the bottle or the air of the laboratory over the open dish, at a height of 1-3 cm from the foam, was examined by the Culture Bottle Method. Out of thirty liters of air examined, five only contained *B. prodigiosus*. In one liter three were found, and in the other four, one each. Clearly the bacterial infection of the air produced by very vigorous foaming was but slight.

In these experiments there was little splashing of the infected liquids; the bursting of bubbles from the foaming surface was the only source of air infection. I next imitated natural conditions more closely. Thru the kindness of Mr. Craig, Chairman of the Sanitary Committee of the Association of Master Plumbers, I had an ordinary porcelain water closet bowl set directly on a four inch cast iron S-trap,

*Described in Science, N. S., XXVIII., 28, July 3, 1908.

having a clean out hole at the crown. The S-trap was connected at its lower end with an ordinary four-inch running trap. A rich soapy emulsion of *B. prodigiosus* was poured rapidly into the water closet bowl so as to rush down thru the two traps, foaming and splashing as it went. Samples of air were collected from the clean out at the crown of the upper trap and from the upper opening of the lower running trap, a few inches only from the foaming surface of the liquid which contained from 300 million to 5 billion bacteria per liter. Everything was as favorable as possible for the discharge of bacteria into the air. Yet, out of 44 liters of air examined, 43 contained no *B. prodigiosus*. One liter showed a group of eleven colonies apparently derived from a single infected droplet. It must be remembered that in all these experiments I used liquids artificially infected with large numbers of specific bacteria and caused to foam by beating them up with a considerable addition of soap. Vigorous splashing was added to the foaming in the last series of tests. Under these extreme conditions, as in Major Horrocks' experiments, the specific bacteria present could indeed be detected in the air; but the actual number present even here was extremely small.

These experiments seemed to offer a reasonable explanation of the difference between Major Horrocks' results and those of other observers. Bacterial infection of the air from foaming liquids may take place. Horrocks, using, for the most part, artificially prepared emulsions and ignoring the quantitativ aspect of the case, naturally obtained positiv results. When the question is approached numerically however the amount of air infection, even under extreme conditions, is so slight that one would scarcely expect the general air of sewers and house drains to be appreciably affected under normal conditions.

The final test of experimental conclusions of this sort must always be made by an appeal to existing conditions under normal circumstances of actual use. The numerous

investigations cited above have shown that the air of the street sewers is singularily free from bacteria. The air of house drainage systems might however be supposed to be worse than that of the street sewers; and with regard to their bacterial condition only the single report of Uffelmann appeared to be available. As a crucial test, I therefor determined to carry out a sufficient number of examinations of house drain air to gain a fair idea of its bacterial composition. With the cordial co-operation of Mr. Craig, I have been able to complete this work and to obtain results which seem to me conclusive.

I studied nineteen different plumbing systems, five in buildings of the Massachusetts Institute of Technology, four in the wards of the Boston City Hospital (thanks to Dr. McCollom), three in tenement houses in East Boston, two at City Hall (thru the courtesy of Dr. Durgin), two at the Hotel Lenox and one each in the Ames Building, in the Technology Club, and in a private residence on Newbury Street. The plumbing pipes were tapped at various representative points, selected to give as wide a range of conditions as possible. Twenty places in all were examined, two in one of the tenements and one on each of the other systems. Of the twenty points, five were on main stacks of vertical soil pipe in the lower stories of the respective buildings, seven were on extensions of vertical stacks, just above the roof, two were on horizontal house drains, three were on branch wastes, two at clean outs and one on a vent-pipe at some distance from the main stack.

From each of these twenty places, ten one-liter samples of air were drawn off into Culture Bottles, the taking of the ten samples being distributed over a period of about two hours.

The method of collection was as follows: Short pieces of glass tubing were prepared with a bulb about one inch in diameter blown in the middle of each. One end of this tube was inserted into a perforated rubber stopper which just

fitted the three-quarter inch hole drilled in the plumbing pipe, and the other end was connected to the first of two Culture Bottles. Air was slowly drawn thru bulb and Culture Bottles by water suction. If liquid passed over into the tube by capillarity from the inner walls of the plumbing pipe it collected in the bulb and the Culture Bottles were protected from direct liquid contamination. In three cases however even this precaution was unavailing; the bulb overflowed and spoiled the test.

The Culture Bottles into which the samples were drawn contained dextrose broth. After sampling, they were incubated at 37° for three days and as soon as growth appeared subcultures were made on litmus-lactose-agar, for the isolation of the characteristic sewage organisms, *B. coli* and the sewage streptococcus.

In all, 200 liter samples of air were examined. Three of these samples were lost from the fact that the sewage in the plumbing pipe ran into the collecting tube and over into the Culture Bottle, directly contaminating it with liquid. There remained then 197 tests. Of these only 48 contained any organisms capable of development at 37°; and only four contained sewage organisms The colon bacillus was found three times, and the streptococcus once. In every one of these four cases there was a discharge of sewage in the pipe at the point of examination, and at the moment the sample was taken, so that spray was actually splashing in the air. The first case was on the plumbing system in Wards W and X of the City Hospital. Here samples were taken from a sink drain and at the moments when two of the samples were taken the sink above flushed out and liquid passed over into the bulb between pipe and bottle. In one of the cases *B. coli* was found in the Culture Bottle. The second case was in the Nurses' Home of the City Hospital. Here samples were taken from the main stack. Leaking valves above produced a steady flow down the pipe and there were frequent flushes. Water collected in the bulb in every case

but two; and in one case the sewage streptococcus appeared in the bottles. The other two positiv cases were in one of the E. Boston tenements. Here the air sample was drawn from the main horizontal house drain about ten inches from the foot of a vertical soil pipe. While three of the samples were being taken there were flushes in the soil pipe and much splashing at its base in the house drain. In two of the three cases *B. coli* was isolated from the Culture Bottle. In every one of these four instances samples of air, collected from the same point ten minutes later contained no sewage forms, showing that the contamination was only transient. In the other 193 cases of the 197 no sewage bacteria were present. In not a single case out of the 200 were sewage bacteria found in a liter of house drain air, unless there was mechanical splashing at the point, and at the moment, of examination.

To sum up; my experiments confirm the results of Horrocks in so far as they show that specific bacteria may be ejected from liquids into the air above. My tests of house drain air, like those of Carnelley and Haldane and Laws and Andrewes on sewer air, indicate that mechanical splashing may produce a local infection of the air in immediate contact with the spray. Such an infection does not however extend for any distance or persist for more than a minute or so. I found the general air of house drainage systems singularly free from bacterial life. Out of 200 liters examined, 152 contained no organisms capable of development at 37°. Sewage bacteria were found in the air of the house drains only four times out of 200 liters and then in the presence of mechanical spraying of sewage at the point of collection. The general air of the house drainage systems, aside from this local infection, was, as far as examined, free from sewage organisms. These results accord well with those obtained by Miquel, Petri, Carnelley and Haldane and Laws and Andrewes in street sewers, and with those reported by Uffelmann for drain air.

On the other hand stands the work of Major Horrocks; and very recently his results have been confirmed by another observer whose authority is of the greatest weight. After this communication was prepared I received the latest report of the British Local Government Board and found that it contained a paper by Dr. F . W. Andrewes on the micro-organisms in sewer air.* Dr. Andrewes, who obtained generally negative results when working with Mr. J. Parry Laws in 1894 has now been able to demonstrate that "under certain circumstances, at all events, sewage gives up its bacteria to sewer and drain air." By exposing a large series of plates in a sewer at Hampstead and in a drain of St. Bartholomew's Hospital, London, he isolated 19 strains of streptococci and 42 strains of organisms of the colon group. The most interesting part of this investigation is that Dr. Andrewes was able to show by the use of Gordon's fermentation tests and by the admirable scheme of classification which he himself, with Dr. T. J. Horder have worked out for the streptococci, that the streptococci present were forms characteristic of sewage but rare in the intestines of the Herbivora and generally absent from street air. The bacilli of the colon group were also studied in detail and proved to be characteristic sewage organisms. Finally Dr. Andrewes repeated in two experiments the demonstration of Major Horrocks that B. *prodigiosus* can be isolated from the air of a house drainage system after a culture of the organism has been flushed from the watercloset.

Rightly interpreted, there is no necessary conflict between the experiments of Horrocks and Andrewes and the general consensus of earlier workers Horrocks and Andrewes have shown that bacteria are discharged into the air from foaming and splashing sewage. They have made no estimate of the extent of the air pollution which results. Their method

*Thirty-sixth Annual Report of the Local Government Board; Supplement containing the Report of the Medical Officers for 1906-7.

of exposing plates is an extremely delicate one, but it has no numerical significance. Andrewes estimates that the exposure of one plate for an hour yields as many colonies as the examination of several hundred liters of air. Sanitation in order to be intelligent must however be quantitativ. It should deal, not with theoretical possibilities but with practical probabilities,—measured as closely as possible in regard to their quantitativ importance. I have shown in my experiments that even under the most extreme conditions the number of bacteria which get into the air from an infected liquid is small. I have found by the examination of a series of plumbing systems in actual use that intestinal bacteria could only be isolated four times out of 200 liters, and then only at points of direct local infection from splashing. These results, while they do not contradict the experiments of Horrocks and Andrewes, do explain the apparently inconsistent reports of other investigators. Bacteria do get from sewage into sewer air; but they get there in such small numbers as scarcely to affect its general composition.

In a surface water of fair quality, like that of New York City, the colon bacillus can almost invariably be isolated from ten cubic centimeters. This means a slight degree of intestinal pollution but experience has shown that the chance of infection from such a water is but slight; and we drink it without serious alarm. If one were to breathe for 24 hours the undiluted air of a house drainage system, at any point not immediately infected by mechanical splashing, it appears that less than fifty intestinal bacteria would be taken in; for the daily consumption of air is about 10,000 liters and in 193 liters I obtained negative results from air of this sort. In drinking New York water, twice as many colon bacilli are ingested every day, for 1000 cubic centimeters is a small amount for daily consumption. So there would be less danger of contracting disease from continuously breathing the air of a vent pipe or of a soil pipe, above where liquid is splashing, than from drinking New York water.

There is a possibility of course that the gaseous emanations from decomposing organic matter may exert a predisposing influence which makes the body succumb more easily to specific germs, introduced in other ways. Many have held that in this way sewer gas might indirectly promote disease. This view, supported mainly by the experiments of Alessi, well deserves further study; but I have not dealt with it in the present investigation. I believe that my results, in the light of all previous evidence, warrant the conclusion that the chance of direct bacterial infection thru the air of drains and sewers is extremely slight.

DISCUSSION.

VICE-PRES. DURGIN. While we have listened to the scientific side of this important question we are honored this afternoon with a gentleman who not only possesses the scientific side but the practical. I have the pleasure of introducing Mr. David Craig, who will open the discussion.

MR. CRAIG. At this time it is proper that a word be said, defining if possible the necessary position that the plumber would occupy in view of the facts disclosed by the preceding paper, and the results noted in the work of the National Association of Master Plumbers, through its Sanitary Committee during the past two years. It has been the aim of the committee to get at the facts about sewer air and its relation to the public health whether or no it was a medium of infection through its carriage of the germs of disease. Professor Winslow has very ably placed the matter in its proper light, and while his findings are astounding and mark an epoch in the study of sewer air, it is not apparent that we should broadly modify plumbing practice without due consideration to many other very essential matters connected therewith. The establishing of the exact status of sewer air does not exclude the use of a trap under the plumbing fixtures, as some investigators have suggested, inasmuch as sewer air is harmless as a medium of communicating germs. It is nevertheless poisonous and we must be guarded that "the pendulum does not swing the other way unreasonably" to use the words of Prof. Winslow. Along with the investigation of sewer air the National Association of Master Plumbers has through its Sanitary Committee investigated fully the comparative resistance to syphonage of the water seal of traps used in plumbing for the trapping of fixtures. The results are quite as marked and startling as those noted in the matter of sewer air, and lead me to say that the trap vent-pipe as installed today in our city is a very poor assurance of safety to the trap seal. This phase

of the National Plumbers Sanitary Committee's works, viz., the testing of traps is treated fully and at length in their report the results being tabulated and illustrated.

It is in view of these last facts and results that modification should be had in the installing of plumbing and in plumbing practice. It might be said and expected that these results should be the basis of an intelligent revision with added investigation into many lines which broaden away from the basic facts. The substantial modifying of the present method and material of trap venting not only looks toward a lower first cost, but also toward a benefit to building construction itself through the absence of the cutting of timbers, etc.

It will lower first cost; but unfortunately this is not realized at present, due to the double reason that municipal building departments have placed their approval on some forms of anti-syphon traps and ignored others, with the consequent stiffening in the price of the preferred trap; the price being such that the money saved by the omission of the trap vent pipe is paid in the purchase of the preferred trap.

This must be changed if the building public are to enjoy anything of the results suggested by the work of the National Plumbers Society committee and Prof. Winslow. In the past the plumber but repeated what was told him by the sanitary engineer, and has not been slow to enlarge upon it, earnestly thinking that he was in the right direction. Having naturally observed cause and effect in many directions he has materially built up a fabric which he sincerely thinks is essential to a proper state of the public health. Much might here be said of the hysteria of plumbing legislation throughout its whole effort to date, but that is another story.

This can be said,—that it will be difficult to wear down the opinion created and established by years of plumbing ordinances and laws which at this writing are backed up and

entrenched by the "Bureaucracy of Administration" called into being through their agency.

While I have not at this time any official word from the plumber to you, yet as an observer and student of the whole matter I can say this for my craft,—that they desire to know the truth at any cost, and having ascertained it as good citizens and conscientious craftmen they will not be found opposing proper changes along new lines of practice.

MR. WESTON. Unfortunately I was not present at the beginning of the meeting and have not the whole paper in mind, so that I can discuss it intelligently. What I heard was very instructive, very much in accordance with what we hoped would be true when Professor Winslow finished his work, and I congratulate him upon the important results obtained. It is unfortunate that in most of our city plumbing work the expression of what constitutes good plumbing and bad plumbing in the ordinances of different cities varies so much, so much so that what is recommended in one city very often is forbidden in another. It seems to me that the aim of all plumbing work, especially in the light of facts which Professor Winslow has brought forward, should tend toward simplicity. We should try to eliminate every bend, every unusual device, everything on the inside of the pipe which will interfere with the passage of the liquid from the fixture to the sewer. It seems to me that the best form of drain for a house is the one which offers the freest opening from fixture to sewer, and the more air you can pass from the street sewer backward through the house up to the outside air the better.

In many of our old houses here in Boston, there are old waterclosets and wash bowls and tubs which, even though they may not have a bad effect upon the public health, do cause a great deal of inconvenience and repulsion because of the odors which come from them, odors from decomposing waste upon the the inner walls of the pipes. It is especially

true, I think, of waterclosets and basin overflows. This brings up the question of the seat vent in waterclosets. It seems to me that it has been a very good device for the prevention of odor. It is not required in Boston; it is in some smaller cities of the state. It seems to me that anything in our plumbing practice which would remove the possibility of any odor from the system, and would make it simple and clean, would accomplish all that sanitarians would demand.

MR. CRAIG. In regard to the first proposition, the omission of the running trap, I am, and we are all, rather agreeable to the omission of anything that looks like an obstruction in the drain. If you will believe me, gentlemen, all those things which tend towards the obstructions that do obtain in the drain are not the suggestion of the plumber. A plumber never invented the modern watercloset. I had occasion to know that through a patent suit which was determined some two or three years ago, as, having been connected and acquainted with the early history of that patent, I was a witness for the plaintiff, and in the research, going back as far as 1870, there was not one of those patents ever granted to a plumber. The plumber's practice is opposed to bends. He is taught that from his youth. When our inventive genius from some other sphere of life suggested the wriggley outlet of the watercloset, the plumber thought that a poor thing.

Just a word in regard to the running trap. I agree with that. We had some discussion about it some eight or ten years ago, and as a result believed that in a new section, where the sewer was being laid anew and the buildings were all new and of a residential character, it might be a very nice thing for that sort of condition to obtain. Right on the heel of that investigation I was called into a building down town with a twelve-inch sewer coming into it, and about four inches of water pressure on it from steam in the main sewer. The joint surrounding the main drain, a twelve-inch

joint, had been blown right out, and if that main trap had not been there every joint up to the roof of that building would have been loose. Is it a fact or not, if you could by an ordinance leave out the running trap and that condition obtained, that the city would be liable for damages? Isn't it possible that it is so? In the older parts of the city we have thought of it in that way, that there should be a protection against the blowing off of the steampipe of your neighbor's boilers, or whatever they are, because after all the ordinances that will be made, and all the talk about the tubes or pipes to condense and that sort of thing, you understand that that won't save the matter of blowing out the boilers into the sewer. That is just one condition that crystallized a great many of our opinions toward the retaining of the running trap during this last modification of the city ordinance,—that alone,—and it is the most valid objection that I know of that has been made. Of course we have heard of it freezing from the down draft due to the fresh air inlet, and we have read the figures of the ventilating opportunities that it has, how many cubic feet it will discharge, etc., and we have weighed them all and given them all proper value. But we do say that, with the present method of pipe joining, if you allow an opportunity for those joints to become loose through the omission of the running trap you are doing something that should not be allowed.

MR. WESTON. I hope that I did not make myself misunderstood as advocating an abolition of all traps in sewerage systems, regardless of conditions. I did want to say that I believe that our aim should be the abolition of those things as far as possible. It is impossible, of course, in old plumbing systems to apply the same rules that one can in new. I have had a fairly intimate connection with two or three cities which have started anew on their sewerage systems and have applied the newer principle with great success, but I know that in the old towns of England such a

procedure would be almost suicidal. Great progress could be made if we could prevent discharge of steam into sewers, and I think some ordinance to prevent the steam going into sewers directly would be far more economical than to make the putting in of running traps necessary throughout the whole system. Neither should one forget that boiling hot water is nearly as bad as live steam.

PROF. SEDGWICK. I would like to say just a word in recognition of the unusual character of this research of Professor Winslow's at the instigation of the Association of Master Plumbers. We hear a great deal of talk now-a-days about craftsmen and trades unions and the like. We hear a great many unpleasant things said. Some of them I think ought to be said and must be said. But when we get a chance to say what we may now say, that here is an association of craftsmen which has undertaken to go into a matter of public importance in a scientific way, to spend money to get accurate results, and then stands ready also to govern its action by those results, we have one of the most hopeful signs of the times.

All through this work I have myself as an onlooker taken the greatest interest in it, because it seemed to me that it was an inspiring feature, a hopeful note of the times, that the National Association of Master Plumbers should have, to begin with, a sanitary committee at all; that it should set that committee to work and put the work in good hands; that its committee should seek out scientific aid; that it should stand ready to accept the results, whatever they might be, and to govern itself accordingly. That is an attitude which can only command the respect and the regard of every American citizen, and I think that we ought to feel very grateful to the Association and to the spirit of the times that things are working in so auspicious a direction.

As for the results, those of us that are as old as I am must look at them with mixed feelings. Some of us were brought

up to think that sewer gas was the very devil, and that those people who had any pipe coming into a bedroom, or even into a house, were in grave danger of their lives. If a case of typhoid fever broke out in a family almost the first thing that the doctor did was to run to the basement and see if there was a broken pipe, and, as there generally was, he usually came to the conclusion that it was the sewer gas which had caused the disease. He never thought of looking at the milk pail, or at the school, or at other vehicles of infection; sewer gas was everything. Then a few of us who tried to keep a level head said, "If that is the case, it is rather odd that sewer air is so free from germs, and that men who work in sewers are so uniformly healthy and strong." And so we became sceptical on the matter, and pushed the pendulum over to the other side and said "Sewer gas undoubtedly may be sometimes a poisonous gas, but that it carries disease germs, which have not got wings to enable them to fly on the gentle breezes which it makes, is an idea that we cannot entertain." And now come the experiments of Major Horrocks, who says that after all such gas does contain germs, and then come, fortunately at the very same time, the explanatory researches of Professor Winslow. This is the second time that Professor Winslow by applying the quantitative method has reached what I believe to be the truth. The first time was in the ice problem. People were saying that ice was bad, because if you froze up typhoid fever germs in ice and then examined a particle of that ice, made a culture of it, you could still get typhoid germs. That was true, but they forgot to count the number that they froze up and the number that they got out after freezing. When Professor Winslow did that he found that 99.9 per cent. had died in the freezing, and although there were still a very few left, one here and one there and one over yonder, yet to say that ice was as dangerous as the water from which it came, or anything approaching that, was simply absurd. His results have stood firm until this day, although it is several

years ago that they were made. And now for the second time, applying the quantitative ideas to qualitative work, the qualitative work of others, I believe that he has reached the same correct conclusion.

DR. CHAPIN. May I have just one minute to say that this is the finest work that has been done and the finest paper that I have heard for many a day? (Applause.) I think this Association is to be congratulated that we are permitted to hear it and have it appear in our Journal. The problem itself is certainly an important one; but there is something as Professor Sedgwick has just suggested still more important than its solution. The solution of this problem has enabled Professor Winslow to emphasize, more than has ever been emphasized before, the fact that in all studies of infection we must make the study a quantitative one.

MR. RICKARDS. Mr. President, having some time ago been rather innocently drawn into a controversy on this subject, I have listened with the greatest of interest to Professor Winslow's exhaustive paper, have been pleased to see the quantitative factor brought out so fully. If we take for an example, a case of typhoid fever in a house where the dejecta from the patient is emptied down the closet without the use of disinfectants, we have a possible chance of infection, but from a mathematical standpoint how much chance is there that any of the typhoid bacilli will find the alimentary tract of any other person living in that house? May we not conclude from this paper that the attention of public hygienists may more profitably be put upon other sources of infection?

Our present plumbing ordinances need revision. Some of them unless liberally interpreted are capable of working great injustice. To illustrate, some time ago in planning a laboratory we found that according to the plumbing laws of the city of Boston each and every small sink, (9x12 inches),

of which we had twelve, would have to have a trap and a vent, which would mean if the law had been insisted upon in our case that all over a large microscope room we would have had a system of vent pipes and traps which would have made our laboratory look like a factory at best. Fancy the result! It might be added that a liberal interpretation has worked no harm to any one. Perhaps thru the Sanitary Committee of the National Plumbers Association we may look for assistance.

PROFESSOR WINSLOW. Mr Chairman, I have intended for some time to write a magazine article on the subject of commonsense in sanitation. As long as you have called on me again, and as I perhaps never shall write the article, I will give the idea away now for what it is worth.

As I look at it, we have a certain amount of energy and money to spend in protecting the public health. That energy seems likely to be greatly increased in the near future. Sanitary science, the public health, are phrases to conjure with. We have a large national organization, under the guidance of distinguished political economists, devoted to stirring up this sentiment and increasing the amount of energy and money that can be devoted to the public health. I think, ladies and gentlemen, it is time that the sanitarians of this country saw to it that that energy and money is wisely used. I have no doubt that there are numerous ways in which some good may be accomplished, some disease may be prevented, but we all know as sanitarians that in certain directions a given amount of money and energy can do a certain amount of good, that $100 or $1,000 will save so many lives, and that in other ways that amount of money, if you spent it every year, would not save a life in a century. There are certain means of spreading contagious disease which are known, and whose prevention is known, and it is very essential that our energy should be devoted to those

and not squandered on things which are only theoretical and possible and of minute importance.

I hope very much that in some way the members of this Association and of other associations made up mainly of professional hygienists should prepare—I don't think anything can be done at the present moment, but they should prepare—to assert themselves on this matter, to have it understood that there is a real science of sanitation. Sanitary reform is not a matter which can safely be left to medical men, as such, unless they are trained sanitarians, and it certainly cannot be left to those who are entirely laymen as far as sanitary science goes. We want to see that what energies we have are devoted to those diseases which can be prevented, and can be prevented at the minimum expense. Let us do away with those first. Let us do away with typhoid fever from infected water, and with typhoid fever and scarlet fever and children's diseases from infected and dirty milk. Let us devote as much of our attention as we can to a few of these simple things. Then, after they are wiped out, after we have got the maximum interest on our money and our effort, we can go on to minor things, like ice, and sewer air, and various possible and theoretical dangers.

PERSONAL HYGIENE.

By PERCY G. STILES, Ph.D.
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OXYGEN AS A STIMULANT. When Joseph Priestley inhaled some oxygen which he had prepared, he fancied that the effect was slightly exhilarating, and suggested that the use of the gas might sometime become a popular indulgence. We have lately heard of its use to fortify exhausted pugilists. English observers* have shown that runners may slightly lower their records for middle distances (half-mile) by the preliminary breathing of oxygen. In these trials the lessening of distress has been more striking than the gain in speed. Dr. W. G. Anderson† has published a valuable address upon this matter. He has recently found that oxygen is of marked assistance in relieving the dyspnoea and the malaise experienced by mountain-climbers. A new generator of a compact and portable type was taken by him upon expeditions to two Mexican peaks, over 17,000 feet high, and the use of the gas was of the greatest benefit.

These demonstrations make it appear that the common teaching of Physiologies about oxygen needs some modification. It has been usual to say that the normal individual is not effected by the substitution of oxygen for ordinary air, because the blood corpuscles saturate themselves at a low pressure of the gas and also because the tissues are

*Flack and Hill, Journal of Physiology, 1908, XXXVII., p. 77.
†American Physical Education Review, 1909, XIV., p. 277.

constantly offered more oxygen than they will use. It has been recognized, of course, that in pulmonary disease oxygen may be breathed in place of air with advantage, indeed often in the saving of life. Briefly stated, the doctrine has been that oxygen may be efficacious when obstructions hinder the arterialization of blood in the lungs, but that it is superfluous when such obstructions do not exist.

It has been shown that blood takes up nearly as much oxygen from a mixture containing 10 per cent. of the gas as from pure oxygen. Hence it has been argued that raising the proportion of oxygen in the alveolar air cannot be of any service, unless the existing percentage is abnormally low, as it is likely to be in pneumonia. During muscular exercise we know that the alveolar air is quite as rich in oxygen as during rest, the breathing fully keeping pace with the exchange. Quite plausibly, then, one may contend that nothing is gained by running up the oxygen percentage in the lungs. But we are met by the plain facts that have been mentioned.

We believe that the difficulty of the subject can be easily cleared up. When experimenters determine the quantity of oxygen absorbed by blood from various mixtures of that gas with nitrogen and carbon dioxide, they allow time for reaching an equilibrium. It is plain that when a person is at rest there is time for the saturation of the corpuscles traversing the pulmonary capillaries, even though the transit occupies but one or two seconds. It may be quite otherwise when the circulation is greatly accelerated. The time of the exposure to the air may be reduced to one-half or one-third what it was before. The blood may then fail of saturation because it does not remain long enough in contact with the air. Moreover, we can see how a vicious cycle may be established, for if the blood is not fully arterialized at a time when the muscles make maximal demands upon it, then the circulation must speed up to

make good in quantity what it is losing in quality. More acceleration and less complete arterialization may continue to develop, and the heart may be forced ever to greater labor with an ever depreciating blood to sustain it.

If this conception is correct, we can understand why the inhaling of oxygen helps the athlete. The proportion of oxygen in the alveolar air is usually about 14 per cent. Breathing the pure gas may temporarily increase it three or four fold. This enriched air transfers oxygen to the passing corpuscles in a shorter time than was previously required. No gain is realized from this quickened transfer until the speed of the blood-flow exceeds a certain critical rate. This is the rate which just permits the corpuscles to become saturated when normal air is being breathed. Force the circulation a little farther, and the man with the enriched alveolar air enjoys a clear advantage. His corpuscles may still become fully charged, thanks to the rapid diffusion of the gas under extra pressure. In the subject not so protected there sets in the vicious cycle already noted. His very panting and his excessive heart-action add to his muscular metabolism, and his handicap becomes steadily more grave.

Incidentally we may point to a new reason for seeking a good chest development. It is fair to assume that the number of the pulmonary capillaries and their total surface area will be greater in the subject with the broad and deep thorax. In the capacious pulmonary system the average linear flow will be less than in the contracted one. Therefore the corpuscles will remain longer in diffusion relations with the air in the better developed person, and the circulation in such a wide vascular bed can be relatively more accelerated without danger of shortening the exposure too greatly.

MUNICIPAL SANITATION.

By CHARLES V. CHAPIN, M. D.
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GARBAGE TO BE WRAPPED IN PAPER. The last report of the Department of Public Health of Winnipeg refers to the great success attending the use of metallic garbage receptacles in that city. This appears surprising, in view of the fact that in many New England cities much trouble is experienced from the freezing of the garbage to the receptacle, which necessitates the use of a pick, and speedily results in the destruction of the can, or even of cast-iron receptacles. Hence in Providence it has been customary for a number of years, on the advent of freezing weather, to notify house owners to replace their metal garbage cans by wooden ones. A letter from Dr. Douglas, the Medical Health Officer of Winnipeg, explains how metal receptacles can be used in the exceedingly cold winter weather of that city. He states that they have a regulation that the garbage must be drained so as to be free from water, and wrapped in paper before it is thrown into the garbage can. This prevents the freezing to the can in winter, and does much to abate the odor and to deminish the fly nuisance in the summer.

VISITING NURSES FOR CONTAGIOUS DISEASES. Many now believe that more can be accomplished in the way of education by the visiting nurse, than by either the attending physician or the medical inspector. Much

has been accomplished by visiting nurses in the education of consumptives, and in instructing mothers how to care for young infants. For these purposes nurses are very commonly employed by various charitable agencies, and also by departments of public health. They have not hitherto been much employed in cases of scarlet fever and diphtheria, though the education of the family and the patient here is as important as it is in consumption. A scarlet fever nurse and a diphtheria nurse have recently been employed by the health department at Cleveland, and the results are reported as most gratifying.*

MEDICAL TREATMENT OF SCHOOL CHILDREN. The medical inspection of schools was primarily intended merely to discover physical ailments and defects in the pupils and to advise treatment. It was speedily found that in a large proportion of cases the advice, as frequently happens with good advice, was not followed. Then various other steps were taken, nurses were provided to treat pediculosis, ringworm and scabies, and by visits to the homes, to persuade parents to take their children to private physicians or to hospitals or dispensaries. Again trouble arose, for very many parents are unable or unwilling to pay a private physician, and the dispensaries resented the great influx of patients. Then, here and there, a city would establish a special eye clinic, throat and nose clinic, or skin clinic, for the treatment of cases discovered by its inspectors. The tendency has thus been for the municipality to furnish an increasing amount of free treatment for the school children found by inspection to be in need of it.

It is perhaps not surprising that the medical profession should feel that its legitimate practice is being interfered with, though it is very evident that thus far practicing physicians have made more than they have lost, for some

*Report of the Department of Public Health and Sanitation, 1908, p. 5.

of the cases do go to them, while but for the inspection it is improbable that they would have gone to any one for treatment. In Providence the local medical society has recently appointed a committee to inquire into the alleged abuses in connection with the free treatment of school children, and in England several important bodies have considered this subject.

A sub-committee of the Education Committee of the London County Council recently made a report* after a very careful consideration of the matter in conjunction with representatives of the British Medical Association. It was clearly set forth that free medical service must be furnished, and two alternatives were considered. First, that existing hospitals and dispensaries should be subsidized by the County; or, second, that the City Council should establish school clinics at which treatment should be furnished by its own medical officers. The latter course was recommended, but was not adopted by the County Council, which has arranged to make payments to existing hospitals for the treatment of school children, a manifestly unfair proceeding, as the hospital staff who do the work receive no compensation.

The Medico-Political Committee of the British Medical Association† also recognizes the necessity for an increase in free treatment, and for large towns advises the establishment of regular school clinics, but for smaller places advises the employment of private physicians who may receive the patients at their own offices. The committee rightly demands adequate compensation for the physicians for this service, and strongly deprecates the throwing of this work upon the unpaid staff of existing hospitals.

It is the opinion of the writer that a wide extension of free medical service must take place as the result of school

*Public Health, February, 1909, p. 147.

†Br. Med. Jour. Supplement, May 15, 1909, p. 247, and May 22, 1909, p. 271.

inspection, and that the physicians employed must be adequately paid for their services.

THE REGISTRATION OF INFANTILE DIARRHEA. The sanitary authority at Huddersfield, England, has made great efforts to check this disease, and for the purpose of facilitating the work of prevention has, since July 1st, 1908, required the registration of all cases of diarrhea occurring in children under five years of age. The number reported during the first six months of registration was 349, and the medical officer of health apparently considers the registration quite complete. There were 48 deaths during the same period, which gives a case fatality of 13.8 per cent. The population of Huddersfield is, according to official calculation, 94,777 (Report of the Medical Officer of Health of Huddersfield, 1908, page 32). As there are few data bearing on the prevalence or fatality of the group of diseases included in the term infantile diarrhea, the above facts are of considerable interest.

VITAL STATISTICS.

By MARSHALL LANGTON PRICE, M. D.
Secretary State Board of Health, Baltimore, Md.

POPULATION OF CHINA. Some interesting correspondence has recently been made public, between Professor W. F. Willcox and W. W. Rockhill, United States Minister to China, relative to the population of China.* Mr. Rockhill's views are quite interesting. He says among other things: "According to my views, whatever the population was in 1842, it has not probably increased to any perceptible extent since then. I have shown that the estimates made by the Chinese, whenever Western observers have been able to look into them, should be reduced by half in many cases and in others by perhaps a third." Mr Rockhill gives a Chinese estimate of the population of China of 438,214,000, which he characterizes as the "wildest of all estimates." The reliability of the Chinese figures may be judged by the estimate of the population of Scechuan, which is given by the Chinese as 79,500,000, while the estimate of Sir A. Hosie, made in 1904, was only 45,000,000. Mr. Rockhill gives an official Chinese census of Pekin. This takes account only of the number of families. The total number of families in the inner and outer cities is given as 126,008. Allowing to each family five and five-tenths persons, the population of Pekin reaches the modest figure of 693,044. It appears likely from Mr. Rockhill's comments that all the past estimates of Chinese population have been greatly over the true figures.

* Jour. Am. Statistical Assn., Vol XI., Dec., 1908.

OCCUPATION, MORTALITY IN SHEFFIELD. F. S. Crum has recently reviewed the report of the Medical Officer of Health of Sheffield, Eng.* The report is of special interest on account of Sheffield being the centre for the manufacture of tools and cutlery. The individual trades campared are grinders, cutlers, toolmakers, and file cutters. It appears that in all these trades, notwithstanding the excellent regulations of the under Secretary of State governing dangerous occupations, that the mortality from the respiratory diseases continues to be excessive. In some of the occupations the proportionate mortality in certain decades exceeds 70%.

THE SALE OF COFFINS VS. HARD TIMES AND A LOW DEATH RATE. It would appear that coffins are a commodity that would not fluctuate with good and bad times, being, so to speak, in the nature of a necessity; but it appears from the statement of a representative of a large casket company that coffins also share in general financial depression. The statements of this individual are very interesting, even if fallacious. He explains the depression in the coffin business as follows: "The average person, when times are good and his pocket full of money, remains downtown at his club or at his beer garden (according to his tastes and income) and spends his evening and incidentally his money with his friends to the accompanyment of lobster Newburg and highballs, champagne, or other liquids. Result: An obituary notice in the daily paper. On the other hand, during hard times, when the pockets are not so well supplied and the quotations on champagne and lobster Newburg remain high, the individual remains at home, to the betterment of his finances and health, all of which would indicate that the straight and narrow path leads away from the casket maker and the village churchyard."

*Jour. Am. Statistical Assn., Vol. XI., Dec., 1908.

There is doubtless some sound reasoning in this homely philosophy; at any rate, there are other more important reasons why the death-rate should be low during and immediately following a period of hard times. As is well known, the birth-rate is apt to be low during the period of depression, and consequently the death-rate is likewise depressed. A great many industrial establishments are closed, consequently the number of deaths from accidental violence is decreased. In the clerical class the rush, worry, and long hours, incident to times of prosperity, are succeeded by a period of comparative leisure and light work, all of which causes tend to diminish the death rate.

THE ACCESSORY CAUSES OF ILLEGAL INTERMENTS. The analysis of one hundred and seventy illegal interments, which occured in Maryland from January to August, 1908, gives some very interesting results. These interments were divided by months as follows: In Jan., 18; Feb., 27; March, 36; April, 24; May, 14; June, 15; July, 22; Aug., 14. The bulk of these interments occurred in the remote rural districts. Only two illegal interments occurred in the larger towns. The interments in the first quarter (including the winter months) number 105, as against 65 in the second quarter. The predominating causes in the first quarter were cold weather and bad roads. Thus, bebeginning with such interments in January, the number increases to 27 in February, which is generally the coldest month, and reaches its maximum in March, 36, when the roads are in their worst condition following the spring rains and thaws. The number again declines during April, reaching the minimum in June. There is a sudden increase in July, doubtless due to the necessity for early interment on account of hot weather.

THE PASSING OF THE CENTENARIAN. Dr. Woods Hutchinson, under the title of "The Vanishing

Centenarian; New Light on a Very Old Subject," has thrown a search-light upon the halos of antiquity surmounting the heads of many village patriarchs, with considerable damage to the said halos. To village gossip and popular credulity Dr. Hutchinson opposes the following cold, hard facts. First, that all the reputed persons of extreme age were extremely illiterate and possessed no authentic records. Second, as Dr. Hutchinson says, "All authorities are agreed that of the one class of human beings whose births and deaths are sure of accurate and indisputable record,—the royal families of Europe,—not one has ever reached one hundred years. The same is true of three hundred Popes: indeed, of these only five passed eighty years, and in twelve hundred years only six kings have reached fourscore years. No English insurance company in one hundred and thirty-five years has paid a death-claim to any beneficiary over ninety-six years."

Such evidence as this alone should make us skeptical of accepting the numerous recorded deaths at ages exceeding one hundred years; but not satisfied with this, Dr. Hutchinson has hunted the centenarian in his lair The results of these investigations is the overthrow of many village idols. Dr. Hutchinson even casts aspersions on the time-hallowed Thomas Parr. He is also more than skeptical about the number of persons of phenomenal ages, whom Metchinkoff believed he had found among the ignorant peasantry in the remote mountain villages of the Caucasus, and upon whom the celebrated "sour milk" specific for old age is founded.

THE MAKING OF A CENTENARIAN. In order to understand the making of a centenarian, we must consider somewhat, the psychology of the mind of the aged. We will consider by preference the "seven ages of woman" rather than the "seven ages of man," because, while a man's estimate of his age may be as unreliable as that of a woman in the latter end of his life, a woman's age is as consistently

unreliable throughout her life as the wind, the weather, or any other manifestation of nature. We will assume that a woman has successfully reached her twentieth year. In five more years she is twenty-five; in five more years she is still twenty-five; in ten more years she is thirty-two. At the age of fifty her official age and birth certificate begin to correspond fairly closely. At sixty-five she begins to take a mild pride in her age, and this becomes very much intensified from seventy up. Her interest in contemporaneous affairs is slight, but she takes a great pride in being consulted about such matters as "who built the first house in Smith's Hollow," or "the time the flood washed the railroad bridge away." Here enters the special peculiarity of the aged mind. As is well known the loss of memory in the old, is largely due to an anterograde amnesia and fixation deficiency. That is, while the loss of memory from mental disease is apt to be retrograde, the memory of past events may be clearly retained, but the relation to present events, upon which the sense of time largely depends, is lost. For this reason the same event may at one time have appeared to have occurred only a few weeks ago, and at another to have receded into the dim past. A secondary consequence is that events which the individual has heard discussed in her childhood, and which happened in the life of her parents or grandparents, may appear to her to have been actual occurrences in her own life.

STATISTICS OF AGE AMONG THE ILLITERATE. Not only are the recorded ages of the illiterate notoriously inaccurate, but the general returns of ages, even as low as sixty years and upwards, are so inaccurate as to possess little value. This may be easily observed by examining any table of presumptive expectations and duration of life, arranged by quinquennial periods. This table is founded upon average age at death of those dying in any quinquennial period. It will be found that while there is a constant,

uniform decline after the fifth year, extending to the sixtieth year, there are almost always eccentric fluctuations after the age of sixty.

COWS CAUSE CONSUMPTION,—COWS TUBERCULOUS, COWS STATISTICAL, COWS RAMPANT AND OTHER COWS. Mr. Nathan Straus, of New York, and the Cow appeared simultaneously in the limelight of publicity at the recent meeting of the National Association for the Study and Prevention of Tuberculosis in Washington. Mr. Straus stated that the recent vigorous campaign against tuberculosis had failed to check the great white plague, and that the official statistics of the New York Health Department showed an increase of 33% in two years in cases of tuberculosis, "in the city that Dr. Koch described as leading the whole world in the fight against the disease." The reason for this serious state of affairs, Mr. Straus declares, is THE COW.

Mr. Straus's weapon (to meet the cow on her own ground, so to speak), is universal pasteurization, and tuberculin testing. Mr. Straus's alarm is due to two fallacious arguments. First, accepting the actual increase in the reported number of deaths as an increase in the death *rate*. ignoring the rapidly increasing population of New York. Second, accepting the increase of reported cases as an increase in the actual number of infections.

On the latter ground we might report an increase of two hundred per cent. in Maryland in the past four years. If either increase were correct and constant it would only take about six years to depopulate Maryland and about eighteen years to depopulate New York.

The New York City Department of Health furnishes the following interesting statistics in reference to Mr. Straus's statements:

"In a statement appearing in the newspapers, Mr. Nathan Straus is quoted as having said that there had been consid-

erable increase in tuberculosis in New York City in the past two years, and that the present measures had proven utterly inadequate to deal with the situation. This increase he is reported to have referred to infection through the milk of tuberculous cows.

"A careful examination of the records for the last few years shows that this interpretation of the facts is entirely unwarranted. There has been an increase in the number of cases of tuberculosis reported to the Department of Health, but there has been a steady decrease in the tuberculous death rate, the rate for 1908 being the lowest in the history of the city, and more than forty per cent. lower than when the Department of Health first undertook this work more than twenty years ago.

"It is true that the number of new cases reported has increased materially during the last two years, but this increase in the number of cases is simply the result of the earlier and more complete reporting of cases, and has been continuous since 1894.

"The unusual increase in 1908, we are warranted in believing, was one of the beneficial effects on the publicity attending the meeting of the International Congress on Tuberculosis in Washington and the holding of the Tuberculosis Exhibit in New York City. The correctness of this assumption is further indicated in the last two quarters of the year, when nearly three thousand more cases were reported than for the corresponding priod in 1907.

"Below are given the death-rates from tuberculosis per one thousand in population for a series of years, also the new cases of tuberculosis reported each year in the Greater City since 1900:

TABLE SHOWING NEW CASES OF TUBERCULOSIS REPORTED IN EACH QUARTER OF 1907-1908

	1904	1905	1906	1907	1908	1909
1st Quarter	4705	5137	5266	5330	5408	6002

2nd Quarter	4960	5255	5126	5147	5798
3rd Quarter	4704	5561	5147	4702	5945
4th Quarter	4354	4878	4546	4546	6294

Year	Tuberculosis death rate per 1000 population	New cases of Tuberculosis reported
1900	2.79	11,977
1901	2.64	13,397
1902	2.42	12,346
1903	2.46	15,214
1904	2 50	18,723
1905	2.40	20,831
1906	2.45	20,085
1907	2.39	19,725
1908	2.29	23,325

While it is undoubtedly desirable to pasteurize the milk of tuberculous cows and also milks of unknown origin, it is not likely that milk plays a very serious part in the causation of tuberculosis. In Germany, where milk is practically always taken boiled, the death-rate from tuberculosis is probably somewhat higher than in the United States. In China, where the inhabitants take milk about as frequently as we would eat edible bird's-nests, consumption is very prevalent.

PUBLIC HEALTH LEGISLATION, NEWS AND NOTES

By F. H. SLACK, M. D.
Director, Boston Board of Health Laboratory

PUBLIC HEALTH ACTIVITIES IN THE PHILLIPINES. The annual report of Dr. Victor G. Heiser, Director of Health for the Phillipine Islands for the year ending June 30th, 1908, has just been issued and is a most instructive and interesting document.

Beginning with a brief résumé of sanitary work since the American occupation, from which one gathers that not the least of the benefits thereby accruing to the natives are those of practical, and intelligently administered health regulations, the report goes on to describe in detail the various diseases met with and the methods of combating them. While the commonplace demands on the force and time of the employees of the Bureau of Health are quite sufficient to keep every one busy, several scientific investigations have been made in public health matters. The diseases of uncinariasis, amoebic dysentery, cholera and trachoma have been the subjects of special attention, and the many treatments for leprosy which are constantly recommended have nearly all been given a faithful trial, the X-Ray treatment having given most hope.

The work on segregation of lepers of the Islands although not complete already shows results in the greatly decreased incidence of this disease and is indicative of its final complete extermination.

The population of the Island, stationary for years, and still subject to an enormous infantile death rate, shows a gratifying increase as a result of the work done.

Manila with its pure water supply, sanitary sewage disposal, hospitals, dispensaries, medical inspection of schools and enforcement of pure food and milk laws is an example of what modern sanitary science can achieve in rendering the tropics habitable and healthy. In view of her excellent hospital facilities, her two medical schools, and of the presence of the large staff of the Bureau of Science engaged in research work, she seems destined to become the medical center of the Orient.

A LAW PROVIDING FOR THE INCORPORATION OF MEDICAL MILK COMMISSIONS and the certification of milk produced under their supervision has been enacted by the Senate and General Assembly of the State of New Jersey and approved by the Governor, April 21st, 1909.

This law was inspired by the Essex County, New Jersey Medical Milk Commission, the original one of the half hundred or more similar commissions now established in the United States.

These Commissions have in some places operated at a disadvantage in that they had no such legal standing and that anyone who wished could with impunity advertise milk as certified which had not received the careful attention for purity guaranteed by the Medical Milk Commissions.

Such a law as that passed in New Jersey should be on the statute books of every state having a Medical Milk Commission guaranteeing them protection in their good work and safeguarding the public against fraudulent dealers.

MARY MALLON, BETTER KNOWN AS TYPHOID MARY,* has recently endeavored, by counsel, through a writ of habeus corpus to secure her release from North Brother Island, where she has been confined since March, '07, by the New York City Board of Health.

*The Evening Sun, July 16, 1909.

Her counsel asserted that her confinement was illegal, that even though she were so infected with typhoid fever germs that she gave that disease to persons with whom she came in contact, there was no warrant in law for confining her. He said that there was no more reason for imprisoning Mary than there was in seizing and depriving the thousands of persons afflicted with tuberculosis of their liberty and that if she was legally confined the Board of Health could take many thousands of typhoid carriers from their homes and families and deprive them of their liberty.

The Corporation Counsel opposed the release of the woman and submitted to the Court a return setting out the alleged facts connected with the case.

Dr. Westmoreland, resident physician in the Riverside Hospital on North Brother Island, set forth in an affidavit that the hospital was designated for the care of persons suffering from contagious and infectious diseases. He said that Mary Mallon was received at the hospital in March, '07, having been sent there by the Health Department. The record recited that Dr. George A. Soper made an investigation for the Health Department of the patient and her history. Dr. Soper reported that he found that she was infected with typhoid, that in eight years she had been employed in eight families; that in seven of them typhoid followed her appearance and that twenty-six cases were traced to her. Dr. Westmoreland certified that she was infected with typhoid bacilli.

In his decision suggesting that the unfortunate woman, if she desired, could have a referee appointed to hear evidence and to report whether it was true, as she asserted, that she was free from typhoid germs and should be released, the Court says:

"A careful examination of the return and traverse and the certificates submitted satisfy me that the risk of discharging the inmate of the Riverside Hospital is too great

to be assumed by the Court. The injury which may be done to innocent persons if the facts stated in the return be true are incalculable.

"While the Court deeply sympathizes with this unfortunate woman, it must protect the community against a recurrence of spreading the disease. Every opportunity should, however, be afforded to this unfortunate woman to establish, if she can, that she has been fully cured. And she may, after further examination of her, and additional proof of the truth of the traverse, renew the application; or, if the petitioner prefers, the matter may be sent to a referee under section 1015 of the code to take testimony and report to the Court with his opinion. This will give her an opportunity to cross examine the witnesses called against her and to offer her own medical experts to sustain her claim."

THE DEMAND FOR PROPERLY TRAINED MEN IN PUBLIC HEALTH WORK. There seems to be an increasing demand for trained men in Public Health work whether in executive, laboratory or sanitary lines. It is a pleasure to give a word of welcome to those newcomers who, having had special training, are now actively engaged in their chosen profession, and who will soon be giving us the benefits of their experience. Among others we may mention, Robert N. Hoyt, S. B., Mass. Inst. of Tech. now with Dr. George A. Soper of the Metropolitan Sewerage Commission, New York City, Aubrey Straus, A. B., recently appointed City Bacteriologist of Richmond, Va., W. S. Blanchard, M. D., Tufts Medical School, Boston, appointed Assistant Bacteriologist of the Boston Board of Health Laboratory, and C. K. Blanchard, S. B., of the Mass. Inst. of Tech., appointed to take charge of the bacteriological and sanitary work of the town of Wellesley, Mass.

RESIGNATION OF DR. HERBERT D. PEASE.

The following item of interest to public health workers, appeared in a recent issue of an Albany, (N.Y.) paper:

> Dr. Herbert D. Pease, director of the State hygienic laboratory, has sent his resignation to Dr. E. H. Porter, State commissioner of health. Dr. Pease goes to New York city September 1 to become director of the bacteriological work of the Lederle laboratories, the founder and president of which is Dr. Ernst J. Lederle, former health commissioner of New York city, and at present a member of the State water supply commission.
>
> Dr. Pease has been in the service of the State health department since 1901, first as director of the antitoxin laboratory and more recently as the chief of all that department's laboratory work. He has conducted many of the investigations of epidemics of typhoid fever and other infectious diseases and has been a leader in the educational work along public health lines, especially in the development of exhibits, and particularly in the State tuberculosis campaign. He organized and had charge of the tuberculosis exhibition from New York State at the International Congress on Tuberculosis held in Washington last fall. This exhibit was awarded the highest prize, the gold medal for State exhibitions at the congress.
>
> Dr. Pease has been closely associated with the work of the Albany committee for the prevention of tuberculosis and has given a large number of illustrated lectures on tuberculosis and other public health topics, both here and in other parts of the State. He has also held the

chair of lecturer on antitoxine and immunity at the Albany Medical college for the past eight years.

The scope of the work of the Lederle laboratories embraces all phases of sanitary science.

A. J. Slack, assistant chemist in the State Hygienic laboratory, is also leaving to accept an important position in the laboratories of the State Board of health of Ohio, at Columbus.

VETERINARY HYGIENE.

By W. L. BEEBE, D. V. M.
Bacteriologist for the Minnesota State Live Stock Sanitary Board

IMMUNIZATION AGAINST BOVINE TUBERCULOSIS. The several methods that have been introduced by Von Behring, Koch, Lignières, Arloing, Pearson and others, in the last ten years for immunizing cattle against tuberculosis have all been tried with various results. The one that had been used most extensively in this country was that recommended by Von Behring, which consists of two inoculations of a dried attenuated culture of human tubercle bacilli. By this method it has been proved that immunity is conferred upon the host, but it is not lasting, usually subsiding in from one to two years. This seems to be the fault of all the methods yet tried.

Recently Pro. J. F. Heymans* has introduced a new method which he has tried quite extensively in Belgium. He describes the procedure as follows: "We place about 1 mg. of living bacilli to which some powder is added (what quality and quantity of bacilli gives the best results has not yet been ascertained) in a reed sac which is closed, and for safety's sake coated over with colloion and this sac filled with bacilli is inserted under the skin of the animal."

The following results were obtained in the experiments: "That this heightened resistance of vaccinated animals to experimental infection suffices to protect them materially against natural infection is shown by various experimental

* Protective vaccination of cattle against tuberculosis. Am. Vet. Rev. Vol. XXXV. No. 4, pp. 410-415

series carried on in practice. Ten non-reacting cattle, five of which we vaccinated were put into an infected stable."

"When slaughtered five months later, one of the five vaccinated was tuberculous, the other four not; whilst of the five not vaccinated, four were tuberculous and one not. Of eighteen other sound cattle, nine of which were vaccinated, six of the control animals were tuberculous and three healthy; of the nine vaccinated, two were tuberculous, one was doubtful, and six were healthy (post mortem)."

"Of over 4,000 vaccinated healthy cattle (1905-06-07) retuberculinization showed that the majority of them (about 80 per cent.) did not react; i.e., they remained free from tuberculosis if we can depend upon the tuberculin reaction in vaccinated animals. Careful autopsy of these animals alone can decide. Among the hitherto autopsied animals (about 500) there were about 150 sound vaccinated, which had not reacted to retuberculinization; tuberculosis lesions were found in six. If, therefore, the injection of tuberculin be practical about a year after vaccination, its diagnostic value is as great in the vaccinated as in the unvaccinated."

IMMUNIZATION OF HOG AGAINST CHOLERA. Since 1905 when Dorset, Bolton and McBryde announced that hog cholera was not due to *B. cholerae suis* but to an ultra microscopical organism, their results have been verified by many workers, both in this country and in Europe.

One of the most important points which did not indicate that hog cholera was due to *B. cholerae suis*, as formerly supposed, was that the immunity produced by this organism was not lasting while immunity from natural infection would last for several years and in fact in many instances as long as the hog lived.

Later Dorset, McBryde and Niles found that they could hyperimmunize immune hogs by injecting them at intervals

with large quantities of virulent hog cholera blood. The blood from the hyperimmunized hogs has sufficient potency to protect a susceptible hog for three weeks. If 2 c.c. of virulent hog cholera blood is injected into a hog weighing about 50 pounds, simultaneously with 20 c.c. of blood from a hyperimmunized hog, an immunity lasting 3 to 4 months, and probably longer, is produced. This immunization method is now beyond the experimental stage and many state agricultural experiment stations are producing serum and virulent blood and dispensing it to the farmers as a prophylactic against hog cholera. Serum alone does not seem to have very much power as a curative agent unless administered very shortly after symptons are manifested.

If equally good results are obtained in the future as are reported now, this method of immunization will be a great boon to the hog raising industry. It is estimated that the annual loss from this disease amounts to from $10,000,000 to $50,000,000 annually. Probably $50,000,000 is altogether too high and $10,000,000 too low. But even if it does not exceed the lowest estimate it would be a great saving to the farmers if this disease could be prevented. But before this is accomplished the farmer must be taught that hog cholera is an infectious disease and not due to corn feeding and poor hygienic conditions as many of them now believe. Further, it must be emphasized that the serum treatment is a prophylactic agent and of very little therapeutic value. One drawback to this method of immunization is that it is expensive, actually costing about 2 cents per. c.c. for immune serum and 1 cent per c.c. for virulent blood, where it is produced on a large scale by scientific institutions. Although this charge may seem exhorbitant to the farmer it will pay him in the end to have his hogs immunized.

BOOK REVIEWS.

The Planning of Fever Hospitals. By ALBERT C. FREEMAN, M. S. A. *The Sanitary Publishing Co., London,* 1909. 16*pp.,* 140 *Illustrations. 7s. 6d.*

This little book should be in the hands of all who contemplate the erection of a hospital for the care of infectious diseases. It refers chiefly to English practice though the plan of one of the more modern Parisian isolation wards is included. The chief value of the work to the health officer is that it contains a large number of well selected plans which must certainly offer many useful suggestions to those who are considering the erection of a hospital.

CHARLES V. CHAPIN.

DEATH OF DR. QUITMAN N. KOHNKE.

To the many friends of Dr. Kohnke, long a conspicuous figure in public health work, the following news, copied from the Journal of the American Medical Association for July 10, 1909, will come as a distinct shock.

Quitman N. Kohnke, M. D., Tulane University of Louisiana, New Orleans, 1890; a member of the American Medical Association; for eight years president of the board of health and health officer of New Orleans; once a member of the city council; who figured conspicuously in the yellow-fever epidemic in New Orleans in 1905; died at his summer home in Covington, June 26, from cerebral hemorrhage, aged 51.

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EDITORIALS

PUBLIC HEALTH AND THE AMERICAN PUBLIC HEALTH ASSOCIATION.*

In these days when so much is being said and done, relating to public health, when hygiene may almost be regarded as the great popular fad, it should be worth the while of all whose interests have been awakened in such matters, and especially of those who are professionally engaged in Public Health work, to glance briefly at some of the agencies which have contributed to, and perhaps are chiefly responsible for this changed attitude of the public mind.

For that it is a changed attitude there can be no doubt. And nothing shows this more than the criticisms that

*Read at the Meeting of the American Public Health Association at Richmond October, 1909.

public health officials meet with now compared with those which met them comparatively a few years ago. Then the chief thing they had to contend with was public apathy and even opposition. They were criticized for what they did, especially if it caused temporary annoyance or even slight financial loss to individuals. Now, their chief criticism is for what they do not do. They are held responsible for every outbreak of contagious disease, and the people of a community look with complacency, almost, upon much personal annoyance, and expense, if sanitary betterment is the cause.

Now, to very many people, perhaps the majority, this change of public sentiment seems a sudden thing and largely due to a few individuals whose writings are familiar. No sanitarian would say a word to detract from the credit of these men. We welcome them heartily to the ranks of public health workers, and give them their full mead of praise for what they have done, but we claim very strenuously that this admirable public awakening is not a sudden growth and of virgin soil, but the coming to maturity of seeds planted long ago, the young plants from which have been watered and shielded by devoted individuals whose names are known to but few.

The American Public Health Association was founded by those earnest, devoted men, and the records of its meetings are the best possible evidence of the chief place it holds in the development of public hygiene in the United States. It was at its yearly meetings that every great advance in practical sanitation in this country has been presented and discussed, and its endorsement or disapproval has heartened the scientific worker and discouraged the charlatan as no other agency has.

It was the 18th of April, 1872, that the first meeting was held, which resulted, the following September, in forming, at Long Branch, N. Y., the American Public Health Association. It was probably by accident that the

day on which this movement began was so nearly the one hundredth anniversary of that famous ride of Paul Revere, to warn the minute men through all that "Middlesex village and farm" "to up and to arm" against the foe who were threatening their liberties. But to us it is significant that this first call to united action against a far greater tyranny and more subtle foe, than that represented by these troops marching upon Concord and Lexington should come upon that day also. That first meeting for organization at Long Branch, Sept. 12, 1872, was wholly devoted to getting ready for work. Officers were elected and committees appointed, and it is of great interest to notice, that then, as now, the Association was not made up of physicians only, but of those prominent in any profession which touched upon public health. Such men as Dorman B. Eaton, the public-spirited lawyer, and C. F. Chandler, the chemist, and Frederick Law Olmstead, the landscape gardener, were there consulting with such physicians as J. H. Rauch, Elisha Harris, Hosmer Johnson, and others of equal prominence in the leading cities of the country, from Boston to San Francisco. It is also significant that at that first meeting, a committee was appointed to urge the establishment of a National Sanitary Bureau, and from that day to this, hardly a meeting of the Association has been held at which the establishment of such a bureau has not been advocated. At that time six States only had boards of health, Mass., Cal., Mich., La., Minn., Va., and one of the first works of the Association was to urge their establishment in all of the States, and from that time such boards began to be created quite rapidly, so that at the seventh meeting held in 1878 at Richmond, Va., there were representatives present from the following State boards: Tenn., Mich., Ala., Wis., Mass., Conn., Ark., S. C., Del., N. Y., La., N. J., Ky., Ill., Mo., Miss., and doubtless others had been established which were not represented at that meeting.

Another evidence of the growing interest in the Association was its rapid growth in membership. At the first meeting where papers were read, which was at Cincinnati in 1873, there were less than twenty-five regular members in attendance and probably not more than fifty members in the Association, and at the second meeting there were so few members present that no business could be done for lack of a quorum, and the Association was forced to dissolve and reform itself, and adopt a new constitution, which was really the old one with one or two amendments, one of which was, that nine members should be a quorum for the election of officers. But from that time on there was no trouble about a quorum, for at the fourth meeting ninety-six new members were elected, and when they came together for the seventh meeting the membership had increased to a little over five hundred.

When one scans those lists of new members who were flocking to our Association in those early days he cannot help coming to the conclusion that it was then thought to be a duty which leading citizens all over the country owed to their country to enroll themselves in the American Public Health Association. Thus among those new members elected at that fourth meeting, there were representatives of ten States, and such names appear as, Edward Everett Hale and Prof. Wolcott Gibbs, Marshall Field and L. L. Leiter, and Franklin McVeagh and George M. Pullman, T. Sterry Hunt, Hon. Emory Washburn, and in fact you hardly find a man eminent in later years, or at that time whose name does not appear in those old membership lists.

The present "Committee of One Hundred" on Public Health is a remarkable gathering of able public-spirited men, but an even more representative committee of one hundred could have been selected from the active membership of this Association twenty-five years ago.

In 1873 came our last great epidemic of Asiatic cholera,

which extended its ravages over thirteen States of the Union. It was the American Public Health Association, more than any other influence which made it the last visitation of that scourge. They boldly took the position, when as yet there was no science of bacteriology, that, mysterious as was its origin and spread, it could be conquered by sanitary measures, and especially by cleanliness, pure water, pure air and pure food. The whole question was gone over in a careful scientific way, and Dr. Elisha Harris, the first secretary of the Association, in a paper remarkable for its breadth and acuteness, called, "Practical Conclusions Concerning Cholera," summed up the case and pointed out the way to victory.

And so it has been ever since. The history of the progress of practical and scientific public hygiene, in the United States of America is writ large, and writ nowhere else so fully and completely, as in the proceedings of the American Public Health Association. And the great beauty and strength of its work has been its independence and breadth. Dr. Harris, its first secretary, says at the beginning of the first volume of Proceedings, that it was established as a voluntary Association, free from all official and governmental control, in order to secure for it just that independence which has been such a marked feature of its work. It has welcomed to its councils every one who has had a genuine interest in hygiene, and the true scientific spirit, but has not hesitated to condemn, remorselessly, the mere exploiter of hygiene for private purposes. It is not too much to say that many a man engaged in public health work has gone to his home, after attendance upon one of its annual meetings, with far nobler views of his profession than he had before.

It should be remembered also that its work has not been limited to the United States of America. It has gradually admitted to its membership the other countries of North America, Canada, and Mexico, and also the island

Republic of Cuba. Thus any great sanitary advance advocated by it, has the co-operation of the wisest sanitarians of the whole continent. The great victory over yellow fever, for example, has been much more easily obtained because of the assistance of the Mexican and Cuban governments, and the greatest factor in that assistance has been Dr. Leiceaga of Mexico City, a former president of this Association, and such men as Drs. Guiterras and Agramonte of Cuba, who have both been officers of it. So when epidemics of small-pox threaten the States bordering on Canada, the health officers of those States know that they can count on the active assistance of the Canadian authorities because Dr. Frederick Montizambert, a worthy ex-president of the Association and constant attendant upon its conventions, is the chief of the health department of that country, and every province has sanitary workers who are members also. At the very last meeting, in Richmond, Virginia, it was an inspiring sight to see such men and many others earnestly consulting together, not about academic questions, but concerning the practical problems of public health, how these could be solved most efficiently.

But great as has been its work, it must not rest upon its laurels, but must go forward in greater usefulness. One advance is especially demanded, and that is a strong, well supported journal, through which its work and discussions may be rapidly put into the hands of all its members. The development of the science of hygiene makes the publication of its proceedings in the annual volumes insufficient and out of date. Important discoveries should be known of quickly as possible to be of the greatest use. This can only be done through a journal frequently issued. The experiment has been tried of making use for this purpose, of the "American Journal of Public Hygiene," and as far as the scientific side of the question is concerned it has been a success. Such a journal has as yet no competitor

in the field, and supplies an evident need. But it needs more money to support it and push its sale than the Association with its hitherto limited membership can well supply. The editors of that journal are busy men, and cannot be expected to long give their time to caring for it without pecuniary reward. A larger membership list, or some gifts for the special purpose, or better both, will solve the problem. Is it inconceivable that both of these results can be brought about? We think not, if the task is set about in the proper way. For to repeat what has been several times said, the American Public Health Association represents on this continent, as no other organization does, scientific, sane, hygienic progress and shall it not be fostered?

FRANKLIN C. ROBINSON.

SOME OF THE PRESENT NEEDS OF THE AMERICAN PUBLIC HEALTH ASSOCIATION.*

Since the Association was started in 1872, it has conducted its affairs under a constitution that has served long and well. As the Association has grown in size, important changes have been made in it until, contradictory and ambiguous in parts, a thing of shreds and patches, it was discarded last year for one more suited to its present needs.

Altho, as might be expected, some minor imperfections have been detected, the adoption of the new constitution has undoubtedly been a long step in advance, but like all new things, we must become accustomed to it before it will show itself at its best.

Last year the Association voted to publish its papers and proceedings in Journal form in place of the time honored annual volume. In attempting to carry out your wishes a number of suggestions have come to the mind of the writer.

Believing that under the new constitution, many things are now possible that were not previously, and believing that with active vigorous work the Association will grow as never before, I desire to place these before you for your consideration.

Finances and Publication.

Last year your executive committee was confronted with the fact that its expenses had exceeded its income by about

*Read before the American Public Health Association at Richmond, Va., October, 1909.

$1700.00 at the time of the meeting, not counting certain bills not then rendered. This deficit was attributed largely to the increased cost of publication due in part to increase in the size and activity of the Association's oldest child, the Laboratory Section, and to the birth the year previous of a vigorous section on Vital Statistics. Thus the number of papers for publication was more than doubled and with still another new Section formed, the Association was confronted with a most serious problem which was temporarily solved by the decision to cut down the number of pages published to 400, or about the number that the general Association alone required, if all its papers were published in full. To accomplish this seemingly impossible feat it became necessary for the publication committee to ruthlessly require that practically all papers of more than three or four hundred words in length be abstracted.

Such a policy while absolutely essential in the present emergency would be if long continued absolutely suicidal. Of what use is it to spend time, energy and thought on a paper for publication if it is to be cut almost beyond recognition before it can appear in print. Particularly is this true of technical papers which are often based on months of experimental work where in many instances to condense means the necessity of cutting into the heart of the paper. Of course, there are some instances of verbose or unwieldy papers where condensing would be essential, even were plenty of space available.

To the credit of the members of the Association be it said that in the majority of instances, the requests of the publication committee have been met with good tempered appreciation of the necessities of the occasion.

It should be bourne in mind, however, by those who attend the Association meetings regularly, that about five-sixths of the members cannot attend its meetings and that aside from the prestige of belonging to the Association, the only return such members secure for their member-

ship fee lies in the publications of the Association. If papers are abstracted (and in many cases emasculated) from force of sheer necessity, such members no longer get an adequate return for their outlay unless the stimulating effect of connection with technical committee work may in some few cases repay them.

To solve this publication problem, you must solve the question of finances, for as in other lines of activity, with sufficient money, you can carry out any policy you may choose.

The income of the Association can be increased in a number of ways.

1. By donations or bequests.
2. By reducing expenses.
3. By collecting a greater percentage of fees.
4. By increasing the membership fee.
5. By increasing the membership.

1. To the writer's knowledge, up to the present year, no effort has been exerted to call the attention of those philanthropically inclined to the noble work of the Association. The result has been that with the exception of a few closely in touch with the Association, no such financial aid has been secured. The Executive Committee last year appointed a sub-committee to take up this question and you will hear their report at this meeting.

2. A reduction of the present expenses of the Association can probably be accomplished only at a sacrifice.

3. How shall we collect a greater percentage of fees? According to the statement of the Treasurer last year, there appears to be nearly as many members dropped each year for non-payment of dues for three years, as there are new members added. This means that the growth of the Association while constant has been very slow. Leaving out of consideration those persons local to the places of

meeting who join with us for the meeting only, the reason for such lapses may be attributed to one of several causes. If the member is a political appointee having no deep seated knowledge or interest in public hygiene, he will naturally lose his interest and drop his membership at the end of his term of office. If on the other hand, the party lapsing is still in public health lines, it may mean that the work of the Association has not interested him,—for we can hardly ascribe many lapses to the cost of membership. Could not the lapses of this second class be greatly lessened by a proper "following up" system such as is used in commercial establishments? Would not a personal letter from a properly authorized official serve to cut down the number of such losses, or at the very least bring out the cause of the lapse? In those cases where it is due to sheer forgetfulness, as perhaps is too often the case, would not a member be saved to the Association?

4. If we increase the membership fee we stand the chance of so reducing the number of present and prospective members that the total income of the Association will not benefit much thereby.

5. This brings us to the question of *Increase of Membership.*

It stands to reason that the expenses of the Association do not increase anywhere near in proportion to the increase in the membership. One thousand copies of programs, of lists of members, or of the papers and transactions can be published at a very slight increase over the cost of six hundred. If the present membership were largely augmented the resulting increase in receipts would be for the most part, to use the vernacular, "velvet." Certain of the officers and some individual members have, it is true, spent time thought and energy on the membership question without this being a specific part of their duties,

but to the writer's knowledge no *concerted* effort has been made in recent years by the general Association to increase its membership. To be sure the sections have taken some steps in this direction and the Section of Municipal Health Officers of whose membership committee one of our genial hosts, Dr. Levy, is chairman, has endeavored to bring in a fair proportion of the vast number of Municipal Health men.

There are a tremendous number of men in public health work to-day who are not connected with this Association. Among the State Boards of Health there are quite a number, particularly in the West, which are not represented at all, while the number of city boards not represented is legion. Political appointees holding office for but a short time are of course hopeless, but there are many earnest workers not in this class who might be secured with a little urging.

Under the old Constitution, the names of proposed new members went to the Executive Committee direct. Under the new Constitution these names will be acted upon by the Membership Committee. Should not this committee also take upon itself the duty of outlining and carrying out a campaign for new members. With the exception of one man, the present membership committee has not done this. That there is no animosity in this statement may be inferred from the fact that the writer is a member of the present membership committee of the Association. While each member of the committee has probably endeavored to do something each has undoubtedly felt the lack of concerted effort. There are several ways in which the membership of the Association may be increased. The circular letter has been tried out to some extent by the Municipal Health Officers Section, and we shall have an opportunity this year of judging the result. If it has proved a success, more money spent along this line would prove a good investment.

Would the reduction of dues to associate members, say to $3.00, have any effect in securing new members? If so,

the active membership list would be sufficiently guarded by the present requirements of five years' consecutive membership.

Once new members are secured, their interest should not be allowed to flag. There are many problems to be studied which belong properly to the Association. If the Association does not undertake them, others less qualified will. For example,—the recent movement for a national department of health originated with the American Association for the Advancement of Science and has been pushed by an organization composed largely of the laity. How much was the committee appointed at Mexico by this Association able to accomplish on this question?

If I am not mistaken, the cause for the above lies partly in our lack in the last few years, of a constitution suited to present needs, partly to inertia, to the busy lives we lead, and to some extent to the inability of the members of important committees to get together to transact business during the interim between meetings. There are but few drones among us. Most of the members are extremely busy men and are often confronted with the proposition of making two dollars do the work of one because the people in general have not awakened to the realization that their lives are worth as much or more than their live stock, or their other personal property. To attend properly to the interim committee work of the Association, the members must either give freely of their hours of rest or take time from their hours of work. Naturally the committee work often drifts until the convenient time which seldom comes. Perhaps also, another reason lies in the necessity of placing clerical work incidental to the work of committees on a clerical force already over-busy.

The obvious ideal remedy for the situation is the establishment of a central headquarters with an executive head whose duty it would be to see that the various committee activities of the Association were attended to at the

proper time,—to spur committees into action; to superintend the vast amount of work incidental to preparing papers for publication, and to do such other work not specifically the duty of the officers, as might naturally fall to it. Such a headquarters with its clerical staff might readily take over the clerical work of the various committees and act as a general clearing house for Association work. Such a scheme is of course chimerical until the revenues of the Association are considerabiy increased, which brings us back to the necessity of increasing our membership.

That the public is waking up to the importance of public hygiene and that funds are forthcoming if energies are bent in the right direction, is well shown by the activities of the American Health League with its reputed income of $10,000. That this League made up as it is for the most part of amateur hygienists and the laity has accomplished something by their propoganda cannot be gainsaid. That the work might more properly have been done by our Association is also evident.

To summarize, there is much work of importance for the Association to undertake. With sufficient money, our publication difficulties would vanish. The trouble lies almost completely in the lack of funds, and the lack of funds is apparently due to a lack of concerted effort for an increased membership.

B. R. RICKARDS.

PUBLIC LABORATORIES VERSUS PRIVATE LABORATORIES.

The *American Journal of Public Hygiene* has been requested to discuss editorially "To what extent and in what respects would a State or Municipal Laboratory be justified in taking work in clinical or diagnostic fields away from a private laboratory by offering to do it without charge?"

While this question undoubtedly originated from an actual situation confronting its propounder, a situation concerning which we are absolutely in ignorance, the question has a broad significance and we shall attempt to define certain factors in arriving at a correct solution, inviting correspondence* from all interested. Later we shall attempt to formulate from these answers what may appear to be the concensus of views. Meantime a tentative answer which in our judgment meets the immediate needs of discrimination, daily arising in every public health laboratory in the country, as to whether or not specific work offered or contemplated is properly the work of that laboratory or should be left to private effort, may be stated as follows:

A State Laboratory (using State to mean any government, Federal, State or Municipal) is paid for by the taxpayers. Hence it should do only such work as is of interest or value to all — or at least to the majority — of the taxpayers, such work at present occupying the field chiefly of the transmissible diseases. So long as the demand for analyses outside of this field comes from a small minority of the citizens, it will remain unjust to

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Dr. H. W. Hill, University of Minnesota, Minneapolis.

make all pay for what only a few want. This is the field represented by examinations or analyses of personal benefit to the recipient alone, and such should at present be done by the private laboratory.

To illustrate—an examination of sore throats, to determine if diphtheritic or not, is of interest and importance to every taxpayer in the community, for the results afford him protection—indicate where the machinery of protection should act and guide it in its course. But the determination of the presence or absence of sugar in a given urine is not yet considered as of interest to the community but merely to the individual concerned. No official action hinges on the results, and the community does not secure any return (certainly no immediate and direct return) from the result, as it does in the case of diphtheria.

Again, and for the same reasons, analyses of public water supplies are properly State matters, if the taxpayers have provided facilities for making them, but analyses of private wells (so long as the demand for them is small and scattered) are not State matters.

There seem to be two paths, following either of which may justify the State in assuming even matters of apparently purely individual interest as their proper function. The first and simplest path would be that which leads to a universal (or majority) demand that the State assume such. So long as the taxpayers are willing to pay, they are entitled to buy—and they can buy analyses as well as anything else. The second path is that along which it sometimes seems the State is progressing fast—pushed, rather than by its own volition—the path which leads to the consideration of every detail of the individual's welfare as the concern of the State. We assume now that the material injury and fear of death with which a diphtheria case menaces its associates is reason enough to assume State control of that case—and the State does not confine itself merely to the interests of those still well, by merely pre-

venting further spread, but properly enough, especially of late years, regards even the sick as still continuing citizens—still forming a member of the body which has paid for protection from this disease—and furnishes free treatment, or treatment at cost, as well as free supervision. It would not be a far cry for the State to regard diabetes as a matter not wholly personal to the individual suffering from it; to regard the injury to the State through the loss of services and possible death, preceded by privation or even dependency, of the diabetes patient as somewhat akin in effect, although not in kind to the injury done by the diphtheria case. The individual treatment of a diphtheria case by the State for the good of the patient as distinguished from supervision for the good of the public, is not in essence a totally different matter from the treatment of a diabetes patient for his own good.

It would appear then that the existing status differentiates or should differentiate the field of the State laboratory from that of the private on the basis that the man who ges the free examination as a tax payer and the man who gets the paid examination as a private individual should each receive neither more nor less than what he pays for. The status as it probably will be, if we foresee correctly the trend of events, is that the taxpayer will ultimately pay for all and should then receive all.

H. W. HILL.

ED. NOTE.—Doubtless a great deal of interest may be said on this subject, and the Journal believes that much of value for publication will appear in the course of the discussion which this editorial invites.

THE PREVENTION OF INFANT MORTALITY.

One of the most encouraging signs of the times is the growing recognition of the importance of the campaign against Infant Mortality. If one compares the statistics for various preventable causes of death it is clear that nowhere, not even in the case of tuberculosis, is there a needless waste of life of such numerical importance as that due to the deaths of children under one year of age. Fully half of the waste is certainly preventable, which means between 100,000 and 200,000 lives each year in the United States. Yet the work of life-saving among infants has lagged far behind other branches of sanitary work. The American Academy of Medicine did good service in calling a special conference at New Haven on November 11 and 12, to consider these matters and to urge them upon sanitarians and upon the public.

The Conference on the Prevention of Infant Mortality was divided into four sessions, dealing respectively with Medical, Philanthropic, Institutional and Educational prevention. At the first session, under the chairmanship of Dr. J. H. Mason Knox, Jr., of Johns Hopkins, the specific causes of infant mortality were discussed, including alcoholism (by the chairman), tuberculosis, syphilis (Dr. R. A. Urquhart), improper diet (Dr. J. P. Crozier Griffith) and the factory labor of women. Prof. v. Pirquet, recently called from Vienna to Johns Hopkins, was the speaker on tuberculosis; and his coming to this country must be noted as an event of promise for medical research.

The second session, on philanthropic prevention, was opened by Mr. Edward T. Devine, of the Charity Organization Society of New York, with a valuable statistical

study of the waste of infant life and of its causes. He pointed out that while the infant death rate in New York has decreased faster than the general death rate, this is in part due to changes in racial composition and racial habits, rather than to sanitary progress. Mr. Robert W. Bruère of the Association for Improving the Condition of the Poor, gave a graphic account of the splendid work done by philanthropic agencies for the prevention of infant mortality in the city of New York, and Mr. Sherman C. Kingsley made a similar encouraging report for Chicago. One of the most striking points about this discussion was the unanimity of opinion as to the one method by which the problem is to be attacked. The education of the mother to nurse her own child was the keynote of each paper; and it was urged that the success of a milk depot should be measured, not by the amount of milk distributed, but by the number of nursing mothers whom it trains. The ignorance of the mother in the care and feeding of the infant is the chief cause of the waste of infant life; altho behind this, as several speakers pointed out, lie economic conditions which keep a large class of the population in such poverty that both intelligence and sanitation are impossible.

At the third session, on Institutional prevention, Mr. Homer Folks, of the New York State Charities Aid Association, presided. The weakness of institutional care and the importance of keeping babies with their mothers or of placing them out in the country was again strongly emphasized by Dr. C. P. Putnam of Boston, Dr. E. L. Coolidge of New York, and others.

The final session, under the chairmanship of the writer, was devoted to Educational Prevention, altho it will have been noted that the two previous sessions were also largely concerned with educational problems. Dr. Thomas Darlington described the Division of Child Hygiene recently established by the board of health of New York

City to correlate all activities relating to child health and including a corps of visiting nurses to give direct instruction in the care of children in the individual home as soon as possible after a birth is reported. It was made clear in the discussion that this system, carried out with such success at St. Pancras and Huddersfield and other English towns, may well form an important part of the work of the local board of health. Going back of the child already born, the question of Who should and should not be Parents was then discussed, Prof. C. B. Davenport of Cold Spring Harbor, outlining some of the hereditary laws which underlie man-breeding and Professor Keller of Yale University pointing out the practical limits to Eugenics which are set by public opinion. Finally, Professor John M. Tyler of Amherst and Professor W. T. Sedgwick of the Massachusetts Institute of Technology, spoke on The Education of the Parents of the Future. All progress in special sanitary education depends upon the receptive viewpoint of the public. Sound, popular education in biology and hygiene and sanitation in the public schools is the foundation upon which we must build if we are to build solidly and well. Yet this central problem of elementary education has been less efficiently handled than any other. The time is ripe for a general movement for the improvement and development of elementary instruction in these vital matters,—instruction which shall be sane and practical and well-proportioned, and which shall really help the child to lead a clean and healthy life.

The main lesson of the Congress was that there is a tremendous needless waste of infant life, waste so tremendous and so needless as to demand the attention of the sanitarian, perhaps more urgently than any other aspect of preventable disease. This waste can largely be stopped by the education of the mother in the care of her child and particularly in the importance of breast feeding, which is far more generally possible than is commonly supposed.

This educational work can be carried forward with excellent results by medical and philanthropic agencies of various sorts; but the one agency which can meet the problem in a comprehensive way,—the one agency to which the work really belongs,—is the town or city board of health. Is there any activity of the local board in which a hundred dollars will save as many lives as in this sort of educational campaign? Is there not here a splendid but neglected opportunity for many a health officer?

C.-E. A. WINSLOW.

SPECIAL ARTICLE.

SANITARY SUPERVISION OF COMMUNICABLE DISEASES BY THE DEPARTMENT OF PUBLIC HEALTH.

By Dr. R, G. BRODRICK,
Health Officer, San Francisco, Cal.

The control of Infectious Diseases by sanitary regulations is one of the notable achievements of modern times. It is stated that the death rate during the seventeenth and eighteenth centuries ranged between 50 and 80 per 1000. To-day in such cities as New York, London and Berlin the average is 17 to 19 per 1000; in San Francisco it has been reduced to 13 per 1000. This decrease in mortality is due to the protection from infectious diseases now given to children in the first five years of their lives.

The average duration of life has coincidentally increased. According to Dr. M. Biggs, of the New York City Health Department, the expectation of life in that city in 1866 was a little more than 25 years, while in 1903 it had almost doubled, being about 42 years.

The Department of Public Health exercises sanitary supervision over Cholera, Yellow Fever, Smallpox, Varicella, Pulmonary Tuberculosis, Diphtheria, Membranous Croup, Scarlet Fever, Typhus Fever, Measles, Pneumonia, and every other disease publicly declared to be dangerous to health, by virtue of Ordinance 1034. Typhoid Fever, Bubonic Plague, Cerebro-Spinal Meningitis, Glanders,

Anthrax, Leprosy, Beri Beri, Erysipelas, Trachoma, Pertussis and Mumps have been publicly declared to be reportable diseases. Communicable Diseases are reported by physicians to the Health Office thru one of the following channels:

1. By mail — printed postal cards giving lists of reportable diseases are furnished upon application.

2. By telephone — an operator is maintained day and night at the Health Office.

3. By certificate of death — this is not accepted as complying with the law regulating the reporting of communicable diseases unless death ensued within 24 hours after the physician first saw the case.

Other sources of information are:

1. Hospitals.

2. Institutions having charge of children, such as Schools and Orphan Asylums.

3. Charitable Organizations, for example, the Associated Charities and more especially the Association for the Study and Prevention of Tuberculosis.

4. By notification from the Medical School Inspectors. Cases occasionally first come to our attention when application is made to the Health Office that permission be granted a child to return to school, as is required by Section 17, of Ordinance 1034.

An alphabetical "name" index is kept of all physicians who fail to report their contagious diseases. Upon the first offence a letter is sent to the physician giving the patient's name and address and the nature of the disease informing him that it is a reportable disease and requesting

his co-operation in the future. A second offence calls forth a letter citing the physician to appear at the Health Office and show cause why action should not be taken against him. This is usually sufficient. The Department has been loath to prosecute physicians who fail to report contagious diseases believing that such failure is due to thoughtlessness; but that more good may be accomplished by first impressing upon them the importance of strictly observing the law. In a few instances where neglect to report contagious diseases has led to serious consequences, the offending physicians have been arrested.

Upon receiving information of the existence of a contagious disease from whatever source, search is first made in the Index and if it has not been previously reported a "Record" card is made on which all essential facts, name, age, address, date and source of report are entered and to which are later added every recommendation and official action of the Department, such as reports of sanitary inspectors, names of contacts, findings of Bacteriologist, report of Fumigator, etc.

The "Record" cards are differently colored in each disease, e. g., yellow for Variola; red for Scarlet Fever; blue for Diphtheria; and are filed for four years when they are destroyed.

A duplicate of the "Record" card is furnished the Sanitary Inspector, who is a physician, and he thereupon visits the premises where he verifies the information furnished him, obtains list of contacts, location of school attended by children in family, address of depot supplying milk. Information is given regarding the nature of the disease and precautions to be taken to prevent its spread, a printed form covering these points being left on the premises if considered necessary. The Sanitary Inspector does not see the patient unless specially requested to do so. In case of Scarlet Fever, Diphtheria and Small-pox a placard with the name of the disease is placed on the premises

which notifies the public to keep out. The Principal is furnished with the names of contacts by the Sanitary Inspector and notified to exclude them from attendance in public, private or parochial schools until a permit to return is obtained from the Health Office. Notice is further sent to the milk dealer informing him of the existence of a contagious disease and ordering him to pour milk into a container furnished by the family, or should bottles be left, not to remove same until after fumigation.

The Sanitary Inspector later calls to ascertain if any contacts have sickened and unless previously notified, the Sanitary Clerk telephones to the attending physician one or two days before fumigation to be sure that the patient has recovered. If so, the Sanitary Inspector visits the premises, determines the number of infected rooms with cubic air space. This information is sent to the Disinfector who on the morning following proceeds with gummed strips, formalin lamps or sulphur pots to fumigate the rooms, the amount of material used being included in his report. To test the efficacy of the work a Petrie Dish containing a non-pathogenic organism is uncovered in the infected space and the doors are sealed on the outside. In six or eight hours a Sanitary Inspector calls, breaks the door-seal, takes charge of the Petrie Dish which is sent to the Bacteriologist for examination. In case of positive findings fumigation is repeated.

Time will not permit considering more than a few of the important communicable diseases and I will therefore commence with

DIPHTHERIA.

The decrease of over 37 per cent. in death rate is due in part to the greater number of cases reported; in part to the distribution of free antitoxin. A prompt report of this disease must be made as soon as discovered. This may be done on the printed slip accompanying the sterile

swabs to be obtained at various drug-stores throughout the City, and after inoculation sent to the Health Office at any hour. Examination of the cultures are made at 9 A. M. and at 6 P. M., and the results are immediately telephoned to the attending physicians, written reports following.

Free antitoxin is furnished upon certification from the attending physician that the family is unable to pay for it.

When Diphtheria Bacilli are found in the culture a Sanitary Inspector visits the premises and sees that the patient is properly isolated. No work of any kind, such as, tailoring, laundering, or manufacture of food stuffs is permitted in the rooms occupied by the family, and a case occurring in the rear of a store must be removed to a hospital or the store will be closed and placarded. Isolation is maintained until a culture has shown that the Diphtheria Bacilli are no longer present, but under no circumstances is isolation discontinued until ten days after the beginning of the illness.

Cultures should be sent to the Health Office at least once each week, even oftener at the latter period of the disease, so that the hardship of isolation and of school exclusion might be reduced to the minimum.

Should the Diphtheria Bacillus persist in a patient's throat for three weeks, the organism is isolated and two guinea-pigs are inoculated with a forty-eight hour bullion culture. If the pigs live one week isolation is discontinued. If they die, the test is repeated in two weeks.

TYPHOID FEVER.

An epidemic of Typhoid Fever at the present time is inexcusable and is the nemesis visited upon a community because of carelessness in the conservation of the purity of its water, milk or food supply. Flies are probably the carriers of the disease in isolated cases, whereas water or milk are the more probable vehicles in epidemics.

The adoption of an ordinance requiring all markets, fruit and vegetable stores, restaurants and bakeries to be screened with fine wire mesh, the passage of the law requiring that manure be kept in metal-lined covered bins built within the confines of stables, and the enforcement of anti-plague measures have been important factors in producing the comparatively low typhoid rate in this City, but 16 deaths having so far occurred during the present year.

Samples are collected twice a month from the distributing reservoirs of the Spring Valley Water Co. and have invariably been free from contamination. The spring and well waters of certain dairies on the peninsula have been found to contain the bacillus coli communis; and the owners were notified, under penalty of forfeiture of the permit to sell milk, to discontinue their use. The Chief Dairy Inspector in all cases endeavors to locate the source of contamination and gives the necessary orders to remove it.

Outfits, consisting of ½ dram Shell vial and lancet, are now distributed to various drug-stores where they may be obtained by physicians. A 1 to 50 dilution of the serum is used in making the test, and if paralysis and clumping do not occur in one hour, a negative result is reported.

Upon notification of a typhoid case, a Sanitary Inspector visits the premises, ascertains duration of illness, source of water and of milk supply, if there were a history of infection after eating shell-fish, uncooked vegetables or fresh fruit. He investigates if an open sewer, vault toilet, open manure bin or undrained stable exists in the neighborhood. He inquires from the attending physician if the diagnosis has been verified by a Widal examination and if the urine shows Diazo Reaction.

No placard is placed on the premises, but the Sanitary Inspector sees that the patient is isolated in a room properly screened and that the execreta, bed-clothing and other

articles coming in contact with the patient are immediately and thoroughly disinfected. The Danger of Infection from Typhoid carriers, especially when engaged in the preparation of food or in dairy work should be borne in mind. This occurs in about 4 per cent. of cases, the Bacillus Typhosus apparently being harbored in the bile and intermittently execreted with the fæces.

Public safety requires that persons recovering from Typhoid Fever should be kept under bacteriologic control until they are no longer a menace to health.

VARIOLA.

During the past year occurred 171 cases of Small-pox with one death, whereas the year previous there were 249 cases with four deaths. This decrease, due to the strict enforcement of the compulsory vaccination law among school children, proves the same to be not only justifiable but a beneficient exercise of police power over the public health.

During the month of April 1908, following an outbreak of Small-pox in the Mission, Dr. A. A. O'Neill, Chief Surgeon of the Isolation Hospital, was detailed to examine the children attending schools in that District and found 66 per cent. had no vaccination, altho every child had presented a vaccination certificate duly signed by a physician.

Last October, Dr. Bricca, Medical Inspector of Schools, found 11 cases of Variola in a class-room of the Garfield Primary School which is situated in the Latin Quarter, eight of whom had presented certificates of vaccination. Before we were able to stamp out this endemic, 29 cases had occurred among the school children, although the disease did not attack the Italian parents, all of whom, thanks to the vigilance of the Immigration authorities, showed good vaccination scars.

At the request of the Health Department, the Board of

Education has adopted a new form of vaccination certificate, which requires the physician to certify that he examined the child 14 days after vaccination and that the same is successful. Out of an enrollment of 10300 children in 19 schools under Medical Inspection all but 131 have been successfully vaccinated.

When a case of Variola or of Varicella is reported to the Health Office, its Diagnostician, the Chief Surgeon of the Isolation Hospital, is at once notified by telephone; and he investigates the case. Upon establishing the diagnosis as Small-pox, the patient is removed to the Small-pox Department which is now the equal of any place of its kind and where the patient is given the same attendance as might be obtained in any first-class institution. Removal to the Small-pox Hospital is made without regard to the stage of the disease. Every effort is made by the Diagnostician to locate the source of infection. He visits each room in the house and obtains the names, places of residence and business addresses of all contacts and forwards the same to the Sanitary Inspector who thereupon vaccinates them and subsequently visits them every five days for fifteen days. The house holders in the same block are advised of the necessity of vaccination. When cases of doubtful diagnosis occur especially in rooming houses or hotels, large stores or factories, the public interest demands that the "suspect" be removed to the Small-pox Hospital, where under the present arrangement he is completely isolated from those having the disease until such time as a positive diagnosis is made.

It is advised that physicians when in doubt report the case as "suspicious" for among the diseases which have been reported as Small-pox are Measles, Scarletina, Varicella, Syphilis, erythema, multiforma-bullosa, drug eruptions, urticaria, and the various forms of acne.

The Small-pox dead are buried direct from the morgue in sealed zinc lined coffins.

TUBERCULOSIS.

So far the fight against Tuberculosis has been largely conducted by private charity, the municipality being loath to assume the responsibility. The misery, poverty and crime caused by nearly 2000 deaths from Tuberculosis in this City since the fire cannot be over-estimated. Strong efforts are being made in other cities to control this disease; a reduction of 70 per cent. in death rate in the Boroughs of Manhattan and Bronx having been made in 20 years, and it is time that San Francisco whose annual average death rate from Tuberculosis is the greatest of the ten largest American cities acts in defence of the lives of its citizens.

All cases of Pulmonary Tuberculosis are required to be registered at the Health Office, which may be done by postal card or by forwarding a specimen of sputum for examination when such shows tubercle bacilli.

Wooden asphalt lined boxes with blank forms pasted on covers may be obtained without charge at any of the drug stores now used as stations. A report of the examination is telephoned to the attending physician.

The information obtained is for record only, and in no instance are visits made by Sanitary Inspectors unless requested by the visiting physician. Hospitals, Sanatoria and other Institutions are required, when reporting, to give the previous address of the patient.

After removal or death the rooms are fumigated. If renovation is necessary, the owner is notified and in case of non-compliance the premises are declared a nuisance by the Board of Health and vacated until placed in sanitary condition. An ordinance following the lines of the proposed statute recently vetoed by the Governor clearly defining the powers of the Board of Health is now being framed. Indigents requiring hospital care are sent to the Tubercular Wards of the City and County Hospital, there

being accommodations for 118 males and for 13 females. Every effort is made as far as possible to give these patients the benefits of fresh air and abundance of food; and a special Interne is to be assigned as soon as one can be obtained who will supervise the handling of tubercular cases. While most of the cases are incurable, many have been benefitted and upon leaving the Hospital are referred to the Anti-Tuberulosis Society.

To perform the work properly a staff of medical inspectors and visiting nurses is essential. During the past few months the Society for the Study and Prevention of Tuberculosis appointed three nurses whose efforts have been of the greatest value in relieving the sick poor as well as preventing spread of the disease. This work should properly be done by the Health Department whose nurses should visit all indigent cases, report those having no visiting physician to a Medical Inspector who should follow up these cases as well as those discharged from public institutions. A law should be enacted permitting forcible removal of a tubercular person, when necessary; — such as exists in New York and Massachusetts.

AMERICAN PUBLIC HEALTH ASSOCIATION

THE RESULTS OF THE FEDERAL CONTROL OF THE MANUFACTURE OF VIRUSES, SERUMS, TOXINS, AND ANALOGOUS PRODUCTS.*

By Dr. JOHN F. ANDERSON

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The Act of Congress approved July 1, 1902, regulating the manufacture and interstate sale of viruses, serums, toxins, and analogous products has now been in operation about seven years. This supervision and control was vested by the Act above referred to in the Secretary of the Treasury through the Public Health and Marine-Hospital Service.

Some of the products controlled by this law, such as vaccine virus and diphtheria antitoxin, are an important part of the armamentarium of health officers in their fight to control contagious diseases and I think they, as well as the practicing physicians, will be interested to know what have been the practical results of the Federal control of these products.

Previous to the passage of this Act there was no supervision over the manufacture of these products; each manufacturer had his own standard, units of potency, etc., arbitrary or otherwise, guided only by the effect on his

*Read at the meeting of the American Public Health Association at Richmond, October, 1909.

business of putting out a product inferior, when it could be determined, to his competitors.

Prior to 1902 a "sore arm" was a very frequent accompaniment of a successful vaccination, due largely, in my opinion, to the very high bacterial contamination of vaccine virus with streptococci and staphylococci. Also prior to 1902 tetanus spores had been found by different workers in vaccine virus and deaths from tetanus had been attributed to contaminated virus.

While a few of the manufacturers used the Ehrlich standard unit for diphtheria antitoxin most of them measured the strength of their serum, where done at all, by its neutralizing action on 100 M. L. D. of diphtheria toxin, a most inaccurate method.

Each manufacturer of tetanus antitoxin had his own standard and each was different from the other.

For the other products, such as antistreptococcic and other serums, tuberculin, etc., for which there are no standards, and also for diphtheria and tetanus antitoxins, there was no limit to the amount of preservative used and little regard paid to the decrease in potency incident to age.

Some of the laboratories were inadequate in equipment and methods for the safe production of these therapeutic agents, and the stables and barns were such that about half of the firms licensed at the first inspection had to build new ones to comply with the regulations.

Such, in brief, is a summary of the conditions before the enforcement of the Act referred to. Let us now see what are the conditions at the present time.

Without exception, every licensed firm has made extensive improvements in its laboratory buildings, equipment, methods of production and potency of their products. Very important among these improvements has been either the building of separate laboratories for work with such infections as tetanus and tuberculosis or provision in the main laboratory for the complete separation of work of this

kind from that done with diphtheria antitoxin and vaccine virus.

Many have made radical improvements in their barns and stables; others, where the barns were located in the city, have erected new ones in the country.

There has been a marked improvement in the purity of vaccine virus as now produced over that prior to 1902.

In a paper read before the American Public Health Association in 1905* I showed that the average number of bacteria per tube in glycerinated vaccine examined in the Hygienic Laboratory prior to 1902 was 4,698; the average examined for the three subsequent years was only 309, or an improvement of 93.4 per cent.

It is now very exceptional to find streptococci in vaccine. Of the many hundreds of vaccines specially examined since 1902 for tetanus spores, we have never succeeded in finding them in a single instance.

"Sore arms" following vaccination are now exceptional and are usually due to improper vaccination rather than to the vaccine used. By regulation, the interstate sale of the old style "dry" lymph point has been prohibited. The "dry" point, while convenient and much liked, especially by some of the older physicians, was always richer in bacterial contamination than the glycerinated product.

All virus is now required by the regulations to be dated, showing the date on which it should be exchanged for fresh virus, and each lot is required to be examined for tetanus and detailed records kept of such examinations.

Vaccine virus is bought on the open market at frequent intervals and examined in the Hygienic Laboratory for the number of bacteria, the kind of bacteria, its potency, correct labeling, and a special examination is made for the tetanus bacillus.

The practice that some manufacturers had of renting

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*Anderson, John F.: Federal control of vaccine virus. Reports Am. Pub. Health Assn., vol. 30, 1905, p. 201.

calves to be used for the production of vaccine virus is no longer allowed. All animals are required to be killed immediately after the vaccine virus is taken and a careful post mortem made. Detailed records of the autopsy, if pathological changes are found, are to be kept. No virus may be marketed from an animal suffering from a communicable disease other than vaccinia.

Previous to April 1st, 1905, there was no official standard in the United States for measuring the strength of diphtheria antitoxin. On that date, the standard unit made in the Hygienic Laboratory was adopted and all licensed manufacturers were required to standardize their diphtheria antitoxin therewith. The unit is sent bimonthly to the various establishments making diphtheria antitoxin.

Prior to the promulgation of this unit the user of diphtheria antitoxin had no assurance that a package of serum contained the number of units labeled; but now he can feel satisfied that it contains at least the number labeled.

All serums are required to be labeled, showing the date beyond which they cannot be expected to yield their specific results.

Diphtheria antitoxin is bought on the open market at frequent intervals and forwarded to the Hygienic Laboratory for examination. It is examined there for correct labeling, which includes the manufacturer's licence number, the number of units in the package and return date; for potency, or whether the package contains the number of units labeled, and a surplus to allow for deterioration by age; for the amount of preservative, which in the case of trikresol or phenol is not allowed to exceed a certain amount; for bacterial or toxic contamination, especially tetanus toxin. If found deficient in any of these particulars the matter is reported to the Surgeon-General of the Public Health and Marine-Hospital Service for appropriate action.

Since the concentration of diphtheria antitoxin has come

into such general use, sera concentrated by the so-called Gibson method or modifications, in addition to the usual examination are examined for the amount of ammonium sulphate or magnesium sulphate and, in some cases, for total solids. This last is not a minor point for in the effort to obtain a high concentration the total solids have been greatly increased and such solutions are probably not readily absorbed.

As a result of the establishment of a standard by the U. S. Public Health and Marine-Hospital Service antidiphtheric serum was admitted to the Pharmacopoeia in the 8th Decennial revision.

Before the adoption of the standard American unit for tetanus antitoxin on October 25, 1907, by the U. S. Public Health and Marine-Hospital Service, there were as many different units or standards as there were producers of tetanus antitoxin. The physician, in using this serum, could have no accurate idea of the number of antitoxic units the serum contained, as one maker's product was labeled "to contain 6,000,000 units per c. c." and another maker's "to contain 0.75 unit per c. c.," when in fact the first, according to the official standard, had only 90 units per cubic centimeter while the latter contained about 770.

The unit may be defined as follows: "The immunity unit for measuring the strength of tetanus antitoxin shall be ten times the least quantity of antitetanic serum necessary to save the life of a 350-gram guinea pig for 96 hours against the official test dose of a standard toxin furnished by the Hygienic Laboratory of the U. S. Public Health and Marine-Hospital Service."

As a prophylactic the dose is 1,500 units.

There is no Federal control over the manufacture of veterinary sera. Several different makes of veterinary tetanus antitoxin were examined in the Hygienic Laboratory and most of them were found to contain less than 25 units per c. c., while the minimum strength of the tetanus

antitoxin for human use—over which there is an efficient Federal control—is at least 150 units per c. c. and most of it is considerably stronger.

Tetanus antitoxin is bought on the open market and examined in the Hygienic Laboratory as detailed above in regard to diphtheria antitoxin.

One very important result of the establishment of the standard will be that physicians using tetanus antitoxin in the future will be able to give definite amounts of antitoxin and in this way valuable data will be collected as to the number of units necessary for prophylactic and curative purposes.

Other sera for which there are no standards or acceptable methods of determining their potency, such as antidysenteric, antistreptococcic, antipneumococcic, etc., are only examined for sterility, amount of preservative, and correct labeling. The same is true of tuberculin, bacterial vaccines, etc.

There has been much time and work devoted to an effort by the Hygienic Laboratory to discover a method of standardizing tuberculin, but without practical results up to the present.

The Surgeon-General has informed all state and municipal health officers that the facilities of the Hygienic Laboratory are at their disposal for the examination of diphtheria and tetanus antitoxins when for any reason it is desired by them to know the potency of the serum distributed by these health agencies. A number have sent samples to the laboratory for examination and report on the same. In a few instances it was found that the board of health serums barely contained the amount labeled.

Since it has become known that these examinations are made, very few shortages have been found. It would be much to the advantage of the health boards if more samples were sent to the laboratory for examination.

Aside from the administrative part, which is managed

by the Surgeon-General of the Public Health and Marine-Hospital Service, many of the important details in enforcing this law have been based on research work done in the Hygienic Laboratory.

The standard unit for diphtheria antitoxin* was worked out in the Hygienic Laboratory and is issued bi-monthly from the laboratory to makers of diphtheria antitoxin. The preparation of this standard and the standard method of testing diphtheria antitoxin are described in Hygienic Laboratory bulletin No. 21.

The standardization of tetanus antitoxin† is described in bulletin No. 43 of the Hygienic Laboratory. These two bulletins are now accepted as containing standard methods for determining the strength of these two sera and are constantly used by all manufacturers.

Other work of importance done in the laboratory in connection with these products is the question of the influence of age and temperature upon the keeping qualities of diphtheria antitoxin. Based on this work, regulations in regard to the dating of serum will probably be made.

The question of the influence of concentration of sera upon their absorption has been studied.

Efforts are being made to discover a method of standardizing tuberculin.

The work in the laboratory upon anaphylaxis has thrown much light upon the untoward results that sometimes follow the administration of sera and have given us our first knowledge of the cause of those unfortunate accidents. Studies upon this problem are still being made in the hope that some way may be found to avoid them.

Many manufacturers have availed themselves of the

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*Rosenau, M. J.: The immunity unit for measuring the strength of diphtheria antitoxin (based on Ehrlich's normal serum). Official standard prepared under the Act approved July 1, 1902. Hyg. Lab. Bull. No. 21, U. S. Pub. Health & Mar.-Hosp. Serv., Wash., 1905, 92 p.

†Rosenau, M. J., & Anderson, John F.: The standardization of tetanus antitoxin. Hyg. Lab. Bull. No. 43, U. S. Pub. Health & Mar.-Hosp. Serv., Wash., 1908, 59 p.

privilege of sending their scientific men to the laboratory to be instructed in the methods of testing sera in use in the laboratory, and frequently call upon the laboratory for advice in regard to the various technical matters connected with the production of these products.

It might be of interest to you to know how this control over the production of these products is exercised by the Public Health and Marine-Hospital Service. In accordance with the Act of Congress approved July 1, 1902, and the regulations framed thereunder, all persons or establishments engaged in the manufacture and interstate sale of viruses, serums, toxins and analogous products are required to be licensed by the Secretary of the Treasury upon the recommendation of the Surgeon-General, after a sanitary inspection has been made of their establishments, methods, and products.

An inspector visits their establishments and examines carefully the sanitary condition of the buildings, the condition of the animals used for the production of the serum, the technic employed—such as methods of bleeding, collecting and storing the serum, and especially the methods used in measuring the strength of their product. He sees as to the labeling of the product, paying especial attention to the date when the serum is labeled to be exchanged. He also takes samples of their various products, which are forwarded to the Hygienic Laboratory for examination.

Upon the results of the examination of these samples and his inspection of the establishments are based the inspector's recommendation for or against a license for the particular establishment.

After a firm has been licensed to engage in the manufacture and interstate sale of these products, samples of their products are bought at frequent intervals in various parts of the country and examined in the laboratory. The samples are examined, first, as to labeling; second, as to the potency of the product; third, as to sterility and the

presence of toxins; fourth, as to the amount of preservative.

If the samples are found to be deficient in any of the above particulars the matter is at once reported to the Surgeon-General who, in the case of a lack of potency, contamination, or excessive amount of preservative, requires the manufacturer to withdraw from the market that particular lot of serum. This is a comparatively easy matter for manufacturers to do, as they are required to label each lot of serum, etc., with a laboratory number and to keep records to whom the same is sold.

Since April 1, 1905, many samples of serum have been examined in the Hygienic Laboratory, and of this number only a very few have been found to be below strength or to contain a less number of units than labeled, or to have bacterial contamination.

The great advantage of the strict control over these products to the physician, and consequently in the control of the various diseases for which they are used, is of course very manifest.

The great improvement in these products and the method of their production that has been made as a result of the Federal control may be summarized as follows:

(1) All manufacturers have been required to put their stables, barns and laboratories into good sanitary condition, and to keep them so.

(2) When work with tetanus, tuberculosis, etc., is done in laboratories producing diphtheria antitoxin, a complete separation of such work is required.

(3) All establishments are required to be equipped with proper laboratory facilities and personnel to insure the safe and efficient preparation of these products.

(4) Each lot of vaccine virus is required to be examined, bacteriologically, and a special test made for tetanus bacilli, and detailed records kept of such examinations.

(5) The sale of the old style "dry" lymph points is no longer allowed.

(6) All animals used for the propagation of vaccine virus are required to be autopsied and the virus from any animals proved to be suffering from a communicable disease other than vaccinia is not allowed to be sold.

(7) All sera are now required, in addition to tests for potency, where there are standards established, to be examined for and free from bacterial and toxic contaminations; to be correctly labeled; to state the date beyond which they cannot be expected to yield their specific effects; to contain no excessive amount of preservative.

(8) Standards for diphtheria and tetanus antitoxins having been established, physicians have a knowledge of the exact amount of the dose used in each instance.

(9) A standard for tetanus antitoxin having been made, known and comparable amounts of this serum will be used and valuable data gathered as to the amount of tetanus antitoxin needed for prophylactic and curative purposes.

(10) When the physician uses a package of diphtheria or tetanus antitoxin, he may feel assured that every safeguard has been thrown about its production and that it contains at least *the number of units stated on the label.*

THE SCOPE OF PUBLIC HEALTH WORK IN THE PREVENTION OF DEPENDENCE.*

By HOMER FOLKS

Secretary New York State Charities Aid Association

Public health work as now interpreted by public health commissions, boards and departments, state and municipal, includes both the education of the individual and the education of the community. In both cases, the education is with a view to definite and immediate action. It is not education in the abstract, but it is rather an awakening, an exhortation, a propaganda, a crusade, a campaign. The scope of public health work includes getting cities, counties, towns and states, to do those things for the protection of the individual and for the protection of communities which can be done only by governmental action. It means getting local governmental agancies to establish and maintain hospitals, sanatoria, visiting nurses, and other agencies for the prevention of tuberculosis, and for the treatment and prevention of numerous other preventable diseases.

The scope of public health work, thus interpreted and understood, in the prevention of dependency, is beyond the power of any man to define. We know that if public health work as thus outlined can be carried on comprehensively, efficiently, and adequately, to its logical conclusions, the volume of dependence, both public and private, will be enormously reduced. Were I to attempt to say by just how far poorhouses might be abolished, charity societies

*Read at the American Public Health Association at Richmond, Va., October, 1909.

made unnecessary, and charitable workers released for other occupations, by the full performance of public health functions, I should seem, I fear, to be sketching a Utopia, rather than outlining that actual condition which I firmly believe is soon to be brought to pass. Few of us are aware, I think, of the profoundness of the change through which we are passing in our charitable work. We have long studied causes of poverty, sometimes rather academically. The clearer our vision of the causes of poverty has become, the larger ill health has loomed up as a cause. It is not necessary at the moment to consider whether this ill health is due to individual or to social causes, or to what extent it is due to individual causes and to what extent to social causes. Its effect in producing dependence is just as certain in one case as in the other.

It was no accident that the first strong comprehensive movement for the prevention of tuberculosis in New York City was organized by a society directly concerned with the relief of the poor. The connection between poverty and ill health is so direct, so immediate, and so important that the moment any individual or society turns its attention to the causes of poverty, that moment it finds itself in the thick of the public health movement. In the City of New York, the unifying factor in the tuberculosis work is the society which for more than twenty-five years has been engaged in organizing charity; and in the State of New York the unifying factor is a society which for thirty-five years has been engaged in improving the condition of public institutions and the administration of public relief. There could be no stronger proof of the fact that the effort to define the causes of poverty and to control such of them as may be controlled, leads directly and immediately into the field of public health work for the first, most important, and most practicable things to be done.

As to precisely how much dependence in its various forms is due to preventable sickness and death, no one is

able at this time, in my judgment, to make a comprehensive statement. We have isolated facts which are tremendously significant. Recent examination of the health records in one of the cities of New York State of the deceased parents of orphans and half-orphans supported in asylums, revealed the astonishing fact that, so far as the causes of death could be ascertained from the vital statistics (and in most cases they could be) tuberculosis was the cause of fifty-two per cent of the deaths. The number of half-orphans and orphans in institutions in the State of New York is probably between 15,000 and 18,000. Some suggestion as to the possible scope and sweep of public health work and its effects upon dependency may be had in the fact that a successful crusade against tuberculosis would mean, for one thing, a reduction of the census in our institutions for dependent children of from fifteen or eighteen thousand. We have a total institutional population in the State in excess of 100,000. Of all the various classes making up this total, there is probably no class to which tuberculosis fails to contribute its quota. In hospitals and almshouses, as well as in orphan asylums, we find large elements of population which will be removed when this particular campaign or crusade is carried to its logical, legitimate, and inevitable conclusion.

There are other crusades also to be undertaken by public health authorities which will further reduce the volume of public dependence. The movement for the prevention of venereal diseases, from which public health authorities cannot much longer hold aloof, must result ultimately in a great diminution in the demand upon the resources of our hospitals, our children's institutions, our institutions for the blind, and particularly our hospitals for the insane.

Much remains to be done in the prevention of typhoid fever, which in certain localities is a great feeder of orphan asylums. Diphtheria has been brought partly under control, but several chapters remain to be written before that

particular campaign can be said to be closed. Measles, scarlet fever, and whooping cough must be brought under control in the near future. Infant mortality is still conspicuously an evil with which public health authorities must deal. We shall not make permanent headway against alcoholism until we have the significant and progressive support of public health authorities, if, indeed, the later stages of that campaign are not conducted under the leadership of public health authorities.

Speaking as one who has been occupied continuously for sixteen years in promoting wiser administration of charitable agencies, more effective use of charitable funds, and better adjustment of public institutions to the needs of the community, I find myself, with no sharp break so far as I can discover, in the development of my interest, devoting the major part of my time to efforts which but a few years ago seemed to lie wholly outside the field of charitable agencies. In common with a host of other workers, individual and corporate, we are engaged, as we were before, in ascertaining and in restricting the causes of poverty. Our charter requires no change. I am not quite sure that the American Public Health Association and the various state commissions and societies, and municipal health authorities, know quite what to do with these new allies. For good or ill, however, we seem to have come to stay; we wish to help; we wish to work constructively; we wish to supplement and strengthen public health authorities, we do not wish to supplant them nor to be in the way, nor to obscure their claim upon the public for adequate support. We may perhaps be a little awkward in finding our way about at first, but the right hand of fellowship has been held out with such wholehearted goodwill, the needs are so great and so immediate, and the things to do are so evident, that I think neither you nor we will experience much difficulty in working to-

gether harmoniously, nor have I a doubt that the combined strength of the two sets of workers will be vastly more than the sum of the strength of each taken separately.

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Dr. Gardner T. Swarts,	Providence, R. I.
Dr. H. D. Pease,	New York City.
Dr. Wilmer R. Batt,	Harrisburg, Pa.
Dr. Wm. C. Woodward,	Washington, D. C.

Committee to Consider Practical Methods of Education of the People Concerning the Communicability of Gonorrhœa and Syphilis

(Five to be appointed by the incoming President.)

Committee to Solicit and Encourage a Larger Membership in the Association from among Sanitary Engineers of the Countries Represented, and to Consider the Relation of the Engineer Members to the Association

Col. J. L. Ludlow, Winston-Salem, N. C., Chairman.

(with authority to appoint four associates on the committee.)

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(two more members yet to be appointed.)

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Committee on Standard Methods for the Bacterial Analysis of Water and Sewage

Mr. D. D. Jackson, Chairman, Brooklyn, N. Y.

Committee on Standard Methods for the Chemical Analysis of Milk

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Committee on Standard Methods for the Bacterial Diagnosis of Diphtheria

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Committee on Standard Methods for the Bacterial Diagnosis of Typhoid

——— Chairman, *

* Dr. Wesbrook resigned. Chairman to be elected by the members of the Committee.

Committee on Standard Methods for the Bacterial Diagnosis of Tuberculosis

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Committee on Standard Methods for the Preparation of Tuberculin and Mallein

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Committee on Mailing Infectious Material

Dr. M. L. Price, Chairman, Baltimore, Md.

Committee on Standard Methods for the Bacterial Examination of Shellfish

Mr. Geo. C. Whipple, Chairman, New York City.

Committee on Standard Methods for Testing Disinfectants

Dr. J. J. Kinyoun, Chairman, Washington, D. C.

The following Committees have presented Final Reports, but were continued for the purpose of caring for the proofs of the report and to consider any new questions that might arise or be referred to them:

Committee on Standard Methods for the Bacterial Examination of Milk

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Committee on Standard Methods for the Examination of Air

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THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH

OCTOBER QUARTERLY MEETING

Boston, Mass.

The quarterly meeting of the Association was held at the Brunswick Hotel, Boylston street, Boston, Vice-President Samuel H. Durgin presiding.

In the absence of the Secretary, Dr. Chase of Brookline was elected Secretary pro tem.

On recommendation of the executive committee the following were elected to membership:

T. J. Murphy, M. D., of Boston.

Michael J. Cronin, M. D., of Boston.

John D. Tupper, M. D., of the Westport Board of Health.

Cleaveland A. Chandler, of the East Bridgewater Board of Health.

W. N. Magoun, of the Wellesley Board of Health.

W. C. Munro, of the Woonsocket Board of Health.

J. L. Hildreth, M. D., of Cambridge.

F. E. Constance, M. D., of Brockton.

Miss Elizabeth P. Upjohn, Superintendent of Nurses, Boston Consumptive's Hospital.

C. J. Burgess, M. D., of the Lawrence Board of Health.

Mark W. Richardson, M. D., Secretary of the State Board of Health.

Henry J. Perry, M. D., School Physician, Assistant Bacteriologist, Harvard Medical School.

William H. Davis, M. D., Vital Statistician, Boston Board of Health.

Frank R. Hixon, Bacteriologist, Brigham Milk Company, Cambridge.

THE CARE OF PHTHISIS IN CHILDREN THROUGH THE OUT-DOOR SCHOOL.

By Dr. CLEAVLAND FLOYD
Out-Patient Dept. Boston Consumptives' Hospital

In the work of controlling tuberculosis as an endemic disease especially in the large urban communities, three cardinal factors may be recognized; first, education; second, isolation of every advanced case of phthisis, and thirdly improvement of housing conditions. While all these conditions are applicable to the child, the later two are of vital import if the coming generation is to be more nearly non-tuberculous. The effect of direct contact between the consumptive and the child in the home has recently been clearly demonstrated. In a study of children exposed to direct infection in the home in Boston, among 679 instances where this had occurred 36 per cent. showed definite signs of pulmonary consolidation. Sachs in studying 146 tubercular families in Chicago found 29 per cent of the children showed evidence of tuberculosis. Miller, in New York, found 51 per cent of 150 children of tuberculosis parents to be positively tuberculous. Autopsy statistics are also available and show that 34 per cent of all children over two years of age in a series of 1,131 in this country were tubercular and French statistics show among 1,432 autopsies 37 per cent of tuberculosis.

In children of school age, the incidence of tuberculosis runs equally high and in Paris has been found to be about 40 per cent. Pulmonary tuberculosis was present in 29 per cent of 2,295 school children examined in New York City

recently, and it is estimated that there are 5,000 tubercular children in the Boston Public Schools. From this small amount of data, it becomes evident that phthisis is not infrequent as has been supposed in the early years of life. Certain general facts in regard to the nature of this disease at this age are of importance as indicative of measures to be adopted. Children while more susceptable to tuberculosis than adults frequently present less evidence of its presence and more rarely succumb. The tubercle bacillus may lie dormant for a number of years and with the debilitating effect of shop or factory work, it may become active. The two common types for which it is important to provide are the cases of latent tuberculosis that show themselves generally as debility, lack of development and backwardness and the closed but active case of tuberculosis that has not as yet become an ulcerated process with the discharge of bacilli. Cases of open phthisis are not very common in children and among several hundred cases of pulmonary tuberculosis, bacilli have only been obtained in ten or twelve instances. These are generally hospital cases and should have institutional care. The other two classes of cases of latent and active closed tuberculosis must receive care through the agency of the school. Up to within a few years, the effort of the school has been largely concentrated in the work on the intellect. The close relationship between mental efficiency and soundness of body has only recently been realized. Without doubt the care of the health of the child should be provided for in the home but in a great many instances it does not occur, partly through poverty, and frequently through ignorance. The home should be reached not only through organized health agencies, but through the educational influence of the school. With the weight of the Health Authority felt in the home, and education on physical development radiating from the school, the child cannot but be reached.

But while education on health will generally find a

responsive ear in the child, actual demonstration of how it is obtained is far more valuable. There are several striking results that are obtained when the child is taught what is meant by hygenic living. They are very receptive to new ideas and readily put them into practice making them part of their everyday life. In many instances where phthisical children are given sufficient food, supervision and proper care, the disease is much more easily arrested, than in the adult and relapses are less frequent. This is in part due to the lack of bad habits, and a greater degree of co-operation obtained from the child. Furthermore it speaks well for natural resistance against tuberculosis in children, that not more develop tuberculosis where the degree and duration of exposure is often so marked. With these facts at hand, the value economically in saving to the community these children, on which the city spends some thousands of dollars annually for education cannot be questioned. Even the advanced case of phthisis where it occurs in the early years of life, will frequently, under the care received in a hospital, steadily improve, and occasionally with a degree of rapidity that is remarkable. Often cases with cavity formation will steadily respond to treatment until the disappearance of all symptoms occurs. The cases of latent tuberculosis as they have appeared at the Clinic of the Boston Consumptives' Hospital have been treated through the Convalescent Home of the Children's Hospital with excellent results and where intelligent co-operation can be had in the home and the handicap of poverty is not too great, a high degree of health has been obtained in some of the most congested parts of the city. The Day School should deal with these questions which may be made a great measure of prophylaxis. The suggestions that have been made for open air rooms or out of door classes will materially aid in preventing the development of active disease. I believe there to be some thousands of just such cases in our schools on which tubercular tests would prove positive. To effectually reach

and treat the children with active pulmonary lesions, the Out-Door School has proved itself to be very efficient. Beginning under the Boston Association for the Relief and Control of tuberculosis as a Children's Camp this has developed into a hospital school where health is foremost and teaching is a theraputic measure. The method is effective as it is simple.

The out-door or hospital school as carried on to-day is in the Refectory Building at Franklin Park, and is a part of the Boston Consumptive's Hospital. The roof of the building is used and is especially adapted for this work and will accomodate several hundred children. The present number in attendance is about twenty-five and it is hoped to gradually increase this number to one hundred. All the pupils show on physical examination definite signs of pulmonary consolidation and a record of their condition is kept at the Clinic of the Boston Consumptive's Hospital. A daily routine is in force under the direction of a nurse or teacher. Three simple meals are served with an average caloric value per child of 2589-95. The mornings and afternoons are spent in study out of doors. Cleanliness is encouraged by bathing facilities and exercise or rest given as needed. Where the child is sick, quiet in the open air with a maximum amount of food is all that is required. In stormy weather a canvas shelter is used as a protection and in cold weather heavy clothing and bags for the legs, supply the necessary warmth. The results of this method of treatment have been very satisfactory. The work which up to the present time has been largely experimental has proved the servicability of the out-door school in controlling phthisis in children. Among fifty-two cases treated up to July of this year, twenty-five have had the disease arrested and all without exception have shown marked general and local improvement. In most instances all symptons have disappeared, all of the arrested cases have returned to the public school and continued oversight has so far revealed only two relapses.

Not only has the condition of the lungs received attention but the condition of teeth, eyes and throat have been improved. If then the children in our Boston schools with tuberculosis are cared for in this way, the advanced case placed in a hospital, the latent case treated by co-operation between school and home, and the incipient and well marked cases treated through the Hospital school, the coming generations should show a much higher standard of physical health than the present. With all the effort that is being put forth for civic betterment, no work, it seems to me, is more worth while than that which makes for health and therefore for the happiness of the city's future citizens.

DISCUSSION

Dr. KENNEDY (New Bedford). It is said that there are 5,000 cases of tuberculosis in children in the Boston schools, and I would like to ask what is done with those cases. Are they kept from attending school, or is any particular treatment given to them?

Dr. FLOYD. I have not come in contact with all the 5,000. That is an estimated number. Where we found definite signs of tuberculosis in the lungs those children have been excluded from the public school by the health authorities in most instances, unless the case after a number of weeks or months proved to be arrested, in which case it is reported back to us and we continue to watch its progress.

Dr. KENNEDY. I would like to ask what is done with them when they are excluded. This is a question that we are all interested in. Boston, of course, is in the forefront, and we, of the smaller cities, look to Boston particularly. Five thousand children to be taken care of, and how?

Dr. FLOYD. I would say that we have made a small beginning in this way only: The advanced cases where they are discharging bacilli, which are in the great minority, have been placed so far as possible in hospitals or isolated in the home under the supervision of our nurses. Cases that are latent, that is, having a little temperature, a slight cough, the glands of the neck and other symptons indicating the presence of tuberculosis, have been sent, as far as possible, to the convalescent home in Wellesley, or out of town to relatives, or kept out of doors in various parts of the city. Then the hospital school is making a beginning on the other cases, where there are marked pulmonary signs

but no discharge of tubercle bacilli. The work is only in the beginning.

Dr. OVERLOCK (Worcester). I would like to ask if, in this question of bettering the condition of these children who appear to be tubercular, the question of tenement house inspection has been taken into consideration.

Dr. FLOYD. As the nurses go into the homes about Boston, bad conditions are reported constantly—(and we have found them constantly)—to the Boston Board of Health. We have received excellent co-operation in urging families, proprietors of tenement houses, to clean up and improve housing conditions. I am afraid, however, that we are not all of us laying enough stress on the importance of living conditions in suppressing tuberculosis. It seems to me that is one of the three factors that I mentioned, which needs very much more care and emphasis than has so far been laid upon it.

DAY CAMP TREATMENT FOR TUBERCULOSIS.

By Dr. DAVID TOWNSEND
Boston Consumptives' Hospital

Until recent years, there has been little or no provision in this country, in the fight against Tuberculosis, for the type of case which for one reason or another is unsuitable for the Sanatorium and yet is not sufficiently advanced to require treatment in an advanced hospital or home.

Germany early recognized the need of some such place as the above and in 1900 opened, near Berlin, the first "Erholungsstatt," "Walderholungsstatt," Convalescent Home or Day Camp. This was established under the auspices of the Red Cross Society. Since 1900 many more such Camps have been started throughout Germany, by various organizations. These Camps were intended purely for those persons who are convalescing from acute diseases, after discharge from a hospital, and who are not in a condition to resume work, for those who are constitutionally frail and delicate and for those who are run down from overwork. Such Camps are especially suitable for tuberculous patients. A large proportion of the cases admitted to the German Camps are tuberculous, 33 1-3 per cent. in Frankfort, 35 1-2 per cent. in Hanover, 56 per cent. in Posen and 70 per cent. of all cases in Berlin.

The first Camp in America was opened here in Boston by the Boston Association for the Relief and Control of Tuberculosis, in the summer of 1905 and like the German Camps was conducted through the summer months. Unlike the German Camps, however, the Camp was for Tuberculous patients alone, and only for those who were unsuitable for

the State Sanatorium at Rutland and yet not ready for a hospital, namely the moderately advanced and the ambulatory advanced case. The aim of the Camp, as has been the aim of all subsequent Camps, was to educate the patient in the care of himself and of his sputum and also to teach him better hygiene and better methods of living so that he would not infect his family or his fellow beings.

Each patient is considered as a human being and not as a tuberculous case presenting only points of medical and scientific interest. Every effort is made to relieve all worry and anxiety, to gain his confidence, and to make him as comfortable as possible. Each patient is given individual attention and a careful study of his habits and idiosyncracy is made. In this way it is possible to know just what each patient needs, when to be encouraged, when to be restrained and when to be corrected. In this way and, in this way alone, can a Day Camp be made a success. It is not an easy task and requires high personality and great tact on the part of those who have charge of the work. The patients come for the day only, returning to their homes in the evening, there to carry out the instructions received through the day and to practice the lessons learned. The patients receive two lunches and a dinner each day, also medical attention. Medicines are used only symptomatically. In all the cases there is a noticeable improvement in eating and sleeping and a diminution in night sweats from the start. In the majority of the cases the decrease in the cough and the improvement in the general condition, pulse and temperature is marked after a few days at the Camp. The medical benefit to be derived from a Day Camp may be summarized as follows: a certain number of cases are enabled to obtain admission to the State Sanitorium at Rutland, who were unable at first examination to obtain admission, after a few weeks at the Camp, a certain proportion are enabled to return to work, although not absolutely well, and a certain number advance and find a resting place

sooner or later in an advanced hospital. In addition, it proves that a tuberculous case is not necessarily hopeless until he dies. Many cases in the past have advanced and died simply for no other reason than the lack of proper facilities for their care and education. By far the most important result is that each Day Camp patient becomes a missionary in the field of Tuberculosis and carries the gospel of pure living and hygiene into his home and the homes of those in his neighborhood, thus, leavening the whole.

The equipment of a Day Camp need not be necessarily an elaborate one. Tents can be used, or a more substantial structure of wood or a Camp may be established in connection with a hospital, such as the one in connection with the House of the Good Samaritan here in Boston. The cost of maintenance need not be excessive and varies with the number of patients treated each day. I quote the figures of the Boston Association's Camps for its three seasons.

	1905	1906	1907
Number of days open....................	123	196	241
Total number of patients, days............	3,914	7,522	15,169
Total number of patients admitted.........	128	196	252
Average daily attendance.................	71	46	63½
Maximum number of patients on one day	58	72	83
Per capita daily cost	$0.837	$0.638	$0.51

Experience has taught me that in addition to the facts mentioned above that the Day Camp when properly conducted, is of value, first: on educational lines; second: as it removes for a time the sources of infection from the homes and the community; third: as it enables cases which cannot go to a Sanatorium, although suitable, to obtain proper care, and fourth: as it helps to complete the cure in some cases which have been discharged from a Sanitorium.

As a result of the first Camp, here in Boston, Day Camps have sprung into existence in Massachusetts and other

States with varying results largely accounted for by the different personalities of those in charge. As you are all doubtless aware the Day Camp in connection with the Boston Consumptive's Hospital, next to its Dispensary, is one of its most valuable educational assets.

EDUCATIONAL MEASURES FOR THE PREVENTION OF TUBERCULOSIS.

By ALEXANDER M. WILSON
Secretary, Boston Association for the Relief and Control of Tuberculosis

The organization of Health Education Leagues, Committees on Sex Hygiene, and Dental Hygiene, and Anti-Tuberculosis Associations is in recognition of the importance of direct educational methods in the prevention of disease, and all show the great awakening of the public in the past few years to a keen interest in everything that has to do with promoting health.

The whole modern propaganda for health is predicated on the knowledge we now have of the nature of certain diseases, and would have been impossible a few decades ago. To the medical profession we are indebted for being taken into their confidence in these matters, and to that self-sacrificing group in the community we must continue to look for leadership in the great campaign that is to be waged against preventable diseases.

In the case of tuberculosis the great burden of debt is to Koch for his isolation of the bacillus, which changed the whole attitude toward this most destructive of diseases, and opened the way to a direct attack upon it. Koch's epoch-making discovery was given to the world in 1882, but it was not until ten years later that the first organized educational campaign was undertaken. It was a group of far-sighted physicians in Philadelphia who first appreciated that if full advantage was to be taken of the new knowledge about tuberculosis, that knowledge must be made to permeate the community so that people of all sorts and con-

ditions would know how this disease spreads and would be able to apply the simple measures of prevention. So we find the Pennsylvania Society for the Prevention of Tuberculosis, started in 1892, the first organization of its kind in the world.

Similar organizations were formed abroad in the next few years, but it was a full decade before the movement gained its second recruit in this country. In 1902 the Committee on the Prevention of Tuberculosis of the New York Charity Organization Society was formed, and organizations in other cities and on State lines quickly followed. In 1904 the National Association for the Study and Prevention of Tuberculosis was formed primarily to encourage the general organization of the country against this disease, and to-day there are more than 200 local and State organizations having for their chief function the education of people about consumption.

Never before was such a crusade entered upon, nor such armies enlisted for so beneficent a warfare. Let us examine their equipment, take stock of their arms and ammunition, gauge their generals, and determine, if we can, whether their plan of campaign gives promise of successful issue.

The Boston Association for the Relief and Control of Tuberculosis, organized in 1903, may be taken as typical of the whole group in its aims and methods. In one important respect, however, it differed from most other organizations in the conditions it found at the start. In most places the first thing agitated for was a sanatorium for the treatment of early cases. Massachusetts had for several years been successfully conducting the State Sanatorium at Rutland, so the new society could at once address itself to the more general problem without diverting any of its energies toward this very necessary factor in the campaign.

No account of educational measures for the prevention of tuberculosis in Massachusetts would be complete, how-

ever, that did not place due emphasis on the educational value of the sanatorium itself. Rutland sends back into the community 700 patients in the year after giving them the most complete health education. Probably no single measure that we will later describe has had an effect equal to the influence of these missionaries of clean, wholesome living, going back to their home communities thoroughly instructed in the nature of tuberculosis, and impressed with the necessity for themselves and their families of the most scrupulous regard for the simple laws of health.

If no cures were effected at Rutland the institution would still make an adequate return for its yearly cost to the taxpayers by its services as a "normal school of health." In a recent investigation of the home conditions of all the patients discharged to Boston during the first eight months of the present year with their disease "arrested," striking confirmation of the effectiveness of the lessons taught in the sanatorium was gained. In nearly every instance the family had moved to better quarters or the patient had found a way to adjust the old home to the outdoor life he had learned to lead. Rutland, then, has been a great factor in the educational campaign that has been waged in Massachusetts for more healthful living conditions.

The Boston Association at once addressed itself to the work of popularizing the present-day knowledge of tuberculosis. The first methods adopted were the use of the time-honored tract and lecture. A short leaflet entitled "A War Upon Consumption" was prepared with considerable care. There were no precedents to guide, and the first rather technical and formidable drafts were finally placed in the hands of Rev. Charles F. Dole, who exercised his skill in reducing the story to simple language easy to read and easy to understand.

The first edition of this leaflet, numbering 50,000 copies, was placed in the hands of public school children of the

grammar grades with instructions from the teachers that they be carried home. More than a quarter of a million copies of this leaflet have been distributed, and it is still doing service on every available opportunity. Other leaflets have been printed and distributed from time to time, and so far as people will make use of tracts they have been given the opportunity.

A vigorous lecture campaign was instituted at the beginning. The services, particularly of young physicians, were asked and freely given, and efforts were made to secure audiences of every description. A good collection of lantern slides was prepared, and a lantern was offered whenever the size of the audience seemed to warrant the expense. Lectures were given in the Normal School, in all the High Schools, in settlements, lodges, labor unions, woman's clubs, and churches.

The largest audiences were reached in Roman Catholic churches where the clergy lent their enthusiastic support. Following addresses before the Central Labor Union, resolutions were passed recommending to local unions that the privilege of the floor be granted at their regular meetings to physicians sent by the Association. Practically every labor union in the city was reached in this way, and the interest aroused was shown by the eager questions that invariably followed the short addresses.

The success of a tuberculosis exhibition in Baltimore stirred the Boston Society to try this method, so a booth was engaged at the fair given by the Commercial Travellers in Mechanics Hall in October, 1904, and a beginning there made one of the most popular measures that has been found for spreading information about tuberculosis. Proceeding upon the success of this experiment the General Court was petitioned for an appropriation of $2,000 to the State Board of Health to cover the cost of an "exhibition of the means and methods of treating and preventing tuberculosis." This exhibition, under the immediate direc-

tion of Dr. George B. Magrath, was held in Horticultural Hall, Boston, December 28, 1905, to January 7, 1906, and had far-reaching consequences. Different groups in the community, as the teachers, the clergy, the labor unionist, the physician, and others, were invited on special days when a program of addresses was arranged to make special appeal to each.

There was a steadily increasing attendance from the start, totalling 27,000 for the ten days the exhibition was open. The attendance at the lectures toward the end taxed the capacity of the lecture room, and on several occasions standing room was at a premium.

The Boston Association secured enough of the material used at this exhibition to form the nucleus of its travelling exhibit, which from that day to this has been used effectively here in Boston, and has been sent to cities and towns throughout New England. It has been shown 13 times in Boston and 77 times in other places, going outside the borders of New England to three cities: Pittsburg and Scranton, Pa., and Syracuse, N. Y.

To-day, of the New England States, Rhode Island, Connecticut, Vermont, and Maine have travelling tuberculosis exhibits of their own, managed in Connecticut by the State Commission on Tuberculosis, and elsewhere by the State Boards of Health. Nothing has yet been found to surpass the exhibit as a means ot attracting the interest of the masses of the people in this propaganda. Properly advertised, it has been known to draw three-quarters of the population of a town during an exposure of a week.

Ingenius methods have been developed in the display of material so as to attract interest and hold the attention. The graphophone, the talking arc light, and electrical illusions show that conservatism has not deterred its promoters from adopting striking methods of appeal.

The exhibit has by no means exhausted its possibilities. In New England we have not utilized the county fairs, nor

have we devised a compact exhibit that can be sent at little expense to small towns. In Boston we are about to try the exhibit in vacant stores on busy thoroughfares. Small exhibits that can be set up in public schools or in store windows are also to be tried. Many of the newer devices and methods will be used in the health exhibit which is to be a part of the Boston-1915 Exposition in the Old Art Museum during the month of November.

The agitation in favor of a consumptives' hospital in Boston furnished the basis for effective educational work. For months petitions were circulated and the newspapers were supplied with "copy" while this campaign was in progress. The establishment of the Consumptives' Hospital Department by Mayor Fitzgerald at the beginning of his administration marked the successful issue of these efforts. Almost the first act of the trustees after the creation of that board was to send through the mails a twelve-page pamphlet on tuberculosis to the 110,000 registered voters in the city. That was soon followed by the posting of signs warning against the dangers of spitting.

This department, organized to establish a hospital for advanced consumptives, has taken a liberal view of its problem, and by the direct educational methods already described, and by the establishment of an out-patient department with its corps of visiting nurses, and a camp for the day treatment of patients sleeping at home, has shown that it considers the problem one to be met by the isolation of the very sick, the careful instruction of the moderately advanced cases, and the education of the people at large in preventive measures. Coupling these activities with ample sanatorium facilities for the cure of early cases, and with efficient public health administration by city and state, regulating living and working conditions, we have a program for the combat of tuberculosis that should show good results with the passing years.

Without attempting to ascribe the result as due to any

of the measures herein described, some of which are of too recent adoption to have had any marked effect, it is pleasing to note that the consumption curve for Boston has since 1882 shown a steady downward tendency, the rate per 10,000 being in that year 42.26 while in 1908 it dropped to 17.98, a decrease of 57 per cent in twenty-six years.

The organization of the Associated Committees on the Prevention of Tuberculosis of the Massachusetts Medical Society during the presidency of Dr. Arthur T. Cabot, marked an important step in the development of educational work throughout the State. These committees have been active in rousing the medical profession to take its true position of leadership in this campaign. They have stimulated the formation of many local committees and societies, and have co-operated heartily in popularizing the travelling exhibit.

One immediate result of the State-wide awakening has been the creation of three new sanatoria. The completion of these institutions and their consolidation with Rutland under one board of trustees will undoubtedly release some of the energies of the new board in the direction of the educational work which is by statute made one of its functions.

Much remains to be done while a clearly preventable disease annually carries off one-ninth of all the people who die, and much of our effort must continue to be in the line of popular education.

OUTDOOR SCHOOL, FRANKLIN PARK—CHILDREN RESTING

OUTDOOR SCHOOL, FRANKLIN PARK—CHILDREN AT WORK

TWO CHILDREN SITTING AT OUTDOOR SCHOOL

OUTDOOR SCHOOL, FRANKLIN PARK — DINING ROOM

DISCUSSION

Vice-President DURGIN. We have with us a trustee of the Boston Consumptive's Hospital, Dr. Minot, who was chairman of the committee of the Boston Society for the Relief and Control of Tuberculosis, that managed the out-door school last year. We will ask Dr. Minot to discuss the papers just read.

Dr. MINOT. The question of the out-door school is one that I have been interested in and I believe to be of very great value. The appearance of the children and their whole surroundings changes after it. Dr. Floyd has said that 25 out of 52 children have had the disease arrested; I think I can say better than that. Many of these children have only been there a very short time. Take the children who have been there over a month, and there is a much larger percent who have had their disease arrested. One of the speakers spoke in regard to the homes of these children. Great effort has been made to improve their homes, and the homes themselves I think are all of them in a very different condition from what they were when the children first entered the school. Many of them have been moved to a great deal better houses, many of them to the country. It has taken no small amount of work to bring that about. The outdoor school will not improve merely the health of the tubercular child but eventually the same idea,—abundant fresh air, etc., I believe will be applied to all children at school.

The day camp that Dr. Townsend has described has been of very great use to the community. It has done much towards its education, towards the prevention of the spread of tuberculosis, direct and indirect, and the cases themselves are many of them very much improved. In some of them

the disease has apparently been entirely arrested—I am not personally familiar with the cases—and the changes in the homes there have been very great. The nurses of the hospital have gone to the homes and improved them so far as that is possible. All this work means not merely a doctor and a patient, but it means somebody who is going to the home. That is a large part of the business,—somebody who will keep going there so often and so effectively as to bring about results. One visit is not of any use at all. You have got to keep hammering and hammering to educate the people that they have got to live better some way or other. You cannot hammer a person who hasn't any money, telling him to go home and live out of doors and be comfortable; you have got to find money, you have got to find a house or whatever may be needed in that case, and gradually the people will learn to live a different sort of life. It is a very slow process. Last year the day school was under the charge of the Tuberculosis Association; this year it is under the Consumptive's Hospital Department of the City of Boston, and it is the same problem, carried on in very much the same way, except it is maintained by a different organization, first a private one and now a public one, and it is much larger than it was before. The campaign as mapped out in Boston seems to be regarded by many people, especially people who have come here from abroad, as being a campaign where every class of person is taken care of—on paper. I wish they were all taken care of in fact. And something is happening in each and every class.

Dr. COOLIDGE. As some of you know, I am an institution man, and I am not supposed to know very much about these other parts of the great organization which we have enlisted in this campaign; but I have been thinking a great deal about it and I have been asked a good many questions about it. As busy as I have been with my own work of building the state institution at Lakeville,

I have been impressed by the importance of a few agencies which I see are gradually becoming organized most effectively.

One of the most important features of the whole campaign is the process of sifting cases and deciding under what conditions each case will stand the best chance of recovery. The more I think about this work and the further I go in the work, the more convinced I am that as large as our campaign is, it amounts to a great aggregation of individual work. The individual case must be studied, the temperament, the home conditions, etc. My own experience has led me to feel that that process of sifting cases, directing them to the proper places, is about the most important part of our work.

I have not heard anything said here today about the night camp, which I think is going to be a very important feature of the work. I believe that there are a great many tuberculous people, tuberculous bread winners, who can continue winning the livelihood for their families if they are given the wholesome night camp in which to spend the nights in the open air.

Then another question that has impressed me as being very important is that of the tuberculosis in the schools about the State, where the subject of open-air schools has not yet been talked and practiced. I was asked only last evening at a small meeting in the town of Bridgewater, "What about these tuberculous children in the schools? What are we going to do with them?" I think there is a problem for our medical school inspectors to take up, and I am of the opinion that some method can be devised for caring for the tuberculous in each school, or in each district in connection with the public schools we have now in operation.

Mr. Chairman, I could talk faster and longer if I were speaking of state institutions, because my experience has been with those institutions. Our three new institutions

which are now approaching completion, I think promise a marked relief of the stress which we have all felt in this campaign, and I believe that for the limited amount of money that has been given us with which to build, we are going to furnish first-class, up to date institutions, and although not having all that we would like in them to do with, they are going to be effective and are going to form a beginning of the greatest sanitarium undertaking in the country.

HOME MANAGEMENT OF CONSUMPTIVES.

By Dr. S. F. COX

Superintendent Boston Consumptives' Hospital

There are many items concerned in the management of a campaign to control tuberculosis in any community, and in the main, it may be stated that such a campaign consists in, *first,* the general education of the public regarding the nature of the disease, how it is contracted, how it is spread from one to another, and the means to be adopted in order to prevent and cure; *second,* the registration of the disease, and *third,* the care and relief of patients and their families.

We are to consider briefly this last item, and more especially are we to deal with the management of the consumptive in his home.

It is usual to classify consumption into three stages.

First, or incipient stage. This is the beginning stage of the disease and offers the most favorable chance for cure. *Second, moderately advanced.* Here the disease is well developed and includes within its scope a wide range of conditions. The chances for improvement are many. Patients frequently go about for varying periods able to attend to moderate duties of work. Some under the best conditions of living and care improve and the process is quiescent, while great numbers advance more or less rapidly. The *third, or far advanced stage,* offers little hope of improvement, and although in many instances life is prolonged, the patients are constantly invalids.

Home management is concerned in all three classes or stages and varies in kind and importance with the stage. In the first stage of the disease, there is no doubt that

a short stay in the sanatorium is eminently the best for the patient. This stay need not be long and the main points to establish are the peculiar features of the disease as manifested in the individual patient and this item will many times control length of stay. The education as provided in sanataria is most important and shapes the course for treatment in the home. In any event whether or not sanatorial experience has obtained, the patient in his home should be under the strict supervision of the physician and the visiting nurse. Home visits by nurses who are especially trained in home work, are of much value; they insure the patient's following out strictly the lesson he has learned at the sanatorium; the nurses are of assistance in sharing the family burden and responsibilities and the nursing associations organized on the plan of co-operation have at hand directly many resources of aid and assistance. Education in this stage as in the other stages is of much importance, and while the principles may have been instilled thoroughly during the stay in the sanatorium, still the application to the daily home routine of life many times needs the assistance of visiting nurse and physician. Often such visits discover some hitherto unknown break in the patient's mode of living inimicable to his cure and dangerous to his family.

Patients in this stage frequently remain at home and improve to full health following in the home the full course as in the Sanatorium. When the patient does not go to the Sanatorium, the physician, augmented by the nurse, institutes in the home the sanatorial routine and by frequent visits insures the faithful following out of the details.

The second or moderately advanced stage offers a most difficult problem for home care for the reason that so large numbers in this stage are able to be about, and because of lack of ambition or the presence of discouragement ignore the rules of health and become sources of contagion constantly dangerous to others. On the other

hand, many in this stage are best treated in the home without danger to the family. Education here is of vital importance — the nurse is the constant watchman. In this stage are frequent acute manifestations of aggravation or complication of the disease and require to a greater or less degree the bed care of the patient. In other words, some nursing is demanded varying in degree according to the extent of the trouble. Much of this can safely be done by members of the family but should in all cases be under the direct control and supervision of the physician and nurse. Patients in this stage may attend day camps, classes, etc., with advantage and benefit, but in any event a visiting nurse is essential in order that home conditions are constantly proper and free from danger of contagion. Food and medicine are important factors in the home care in this stage, for the patient's family as well as for himself. The nurse here as before is the immediate agent in the matters of home relief and assistance.

The third or advanced stage presents the least favorable class for home care. Because of poverty and its attending features it is almost impossible in the great majority of cases to care for the bed-ridden, helpless consumptive, still the visiting nurse again is of invaluable worth in the home. Were it possible to provide hospital beds for all, and if all sufferers in this stage were compelled to go to hospitals, the need of home care in this stage would be removed, but there are many items which arise which I feel should be considered and in a measure respected, and if respected and allowed, make necessary the taking care of those patients in the home. These conditions are family reasons and constantly arise and always have been present as an argument against hospital care. Education here is of greatest importance and not only must we educate regarding the disease but we must teach that hospital care can be a boon to the sick and the dying. It is fair to say that a patient with a promise of health will submit to

absence from family and home while much objection must come when the hospital can assure no hope of recovery.

In conclusion we can say that the home management of the consumptive in the first stage extends and many times inaugurates the sanatorial care of the patient, and spreads education to the surrounding community.

In the second stage it is of importance in education of patient, family, and surrounding community, is a distinct nursing factor of the sick individual and by the supervision and watchfulness of the nurse a safeguard against contagion.

In the third stage home care carefully supervised and in suitable cases replaces hospital care, respecting family requests against removal to the hospital.

DISCUSSION

Dr. FRENCH (Clinton). It strikes me that these very able and instructive papers do not require much discussion, as the weight of evidence is all upon one side, but there is one phase of this question that seems to me,—this being a representative body from all parts of the State, — might well be considered. We know the advantages of the sanitoria that we have in the State and of the proposed institutions that will soon aid us to a greater extent, but they can give us but small aid in comparison to the numbers of those which require it in all parts of the State, and it seems to me that we have got to depend a good deal on the day camps that different towns must institute and carry on. This is being done very largely, and we hope it will be increased in all sections; but there is a side to it that needs to be considered.

Perhaps if I speak of our work in the town of Clinton it might represent many other towns. We instituted a day camp last year and did considerable work, and this year we have converted it into a day and night camp. We have been keeping our patients through the season there and the benefits have been wonderful. I am surprised to see how much cases that have come in, that seemed hopeless, that I have not any idea could have been admitted to the Rutland Sanitorium, have improved. I know of one patient that I sent in in the spring that gained twenty-five pounds in three months there and went home looking wonderfully well. I do not expect she is permanently cured, but the disease is arrested.

We have, as all communities have, a great call on the charitable people of the place to support these institutions. In our hospital, we have to depend on the community largely for aid, and in these day camps, we get little remuneration. If patients are able to pay us three or four dollars a week we let them, but if they cannot pay us any-

thing they are admitted just the same, and if they cannot pay their car-fare to the camp, we pay the car-fare. It is a great drain. For a year or two we can carry it on, for our citizens have responded nobly; but it seems to me that our State legislature should aid us in these matters, and the question is whether we could not ask them to consider this thing and give us aid, and not have to depend wholly upon the charitable people of the town.

Vice-President DURGIN. This is an opportunity for those who are not thoroughly familar with the best methods of doing the work under discussion to ask questions of those who are familar with it, and who are qualified to advise us.

Dr. RIPLEY (Brockton). I would like to ask the last speaker if the city does anything toward the support of the day camp.

Mr. FRENCH. Nothing.

Dr. RIPLEY. I would like to ask that question of other members of the Association, if the various city boards of health do anything towards the support of the day camp.

Dr. CHASE (Brookline). Mr. Chairman, in the town of Brookline, the health department assisted the day camp, both this year and last year, to the extent of about $500. It is carried on by a joint committee from the Brookline Anti-Tuberculosis Society and the Brookline Friendly Society. The camp is put under the general direction of the agent of the Board of Health who represents that department. It is obliged by law to do that, inasmuch as it is contributing financially to its support. The three organizations work together, and the greater part of the money is contributed, by the health department, though the

Anti-Tuberculosis Society furnishes considerable money from subscriptions that it secures. The camp is on the grounds of the Board of Health hospital in the southern end of the town.

Dr. MILLET (Brockton). Why isn't it the duty of Boards of Health to establish night and day camps under the law? How can they escape it if there are people in cities or towns who cannot furnish for themselves reasonable care?

Dr. MINOT. As I understand the law, if a Board of Health rules the patient has tuberculosis, then it comes under the Contagious Act and the Board of Health must pay for its care. But I do not know that there is any law that obliged them to take care of a case until they have so ruled. I believe some cities and towns have so ruled.

Vice-President DURGIN. The city of Boston has elected to have a board of trustees of the Consumptives' Hospital and gives to said board of trustees an appropriation. The Board of Health has no appropriation for such purpose. Another board has the appropriation, and they are wisely and freely using it. Dr .Cox can tell you all about the day camp management.

Dr. COX. The day camp was one of our early departments at the hospital grounds at Mattapan. It was a continuation of the day camp which was started by the Association for the Relief and Control of Tuberculosis of Boston, and in fact that association managed the day camp on the premises the year previous. This department built a rough shack building, which contained examining rooms, a large dining-room and kitchen, and a broad piazza on the slope of the hill. We opened the day camp a year ago last July and continued it all through the winter. The

department does not pay the car-fares of the patients; some of them can pay their own. The organized charities of the city supply car-fares to individuals. We supply the food at the camp, and we also supply milk in the homes, sending milk into the homes not only of day camp patients who need it, but also of other patients, who do not attend day camp but who are taken care of in their homes. The attendance at the camp has gradually increased from a mere handful of 50 patients up to a daily average of over 125. The attendance has been pretty regular, even during the winter months, showing that even the trips to Mattapan, which is to many several miles, can easily be taken by them with a good deal of benefit.

Next to the day camp comes what we call a cottage. It is an open-air sleeping shack, where patients not only stay at night but where they stay all through the day. That cottage was built for that class of people, that otherwise would go to day camp but whose homes were not proper for them to stay at night. That first cottage that was built was more or less of an experiment, the question being whether these people could stand that kind of treatment. I might say that we do not take care of the first or incipient stage of the disease. In other words, any patient who can be admitted to Rutland State Sanitarium we do not take care of; we want to see him at Rutland. We take care of the advanced cases. We opened that cottage the first of April, and we have not seen one winter in it as yet, so we cannot say whether patients in that stage can stand the out-of-door treatment at night as they do in the day camp all day long. We can answer that question better after we have gone through this winter.

The day camp so far has been a success in more ways than one. A lot of the patients have improved; many of them have not improved, but even those who do not

improve are away from their homes for a great part of the day; they are only at home at night. That I think is some benefit.

Dr. FULLER (Walpole). I should like to ask the gentleman if patients are taken from outside of Boston to this camp, provided payment is made.

Dr. COX. No, we don't take patients from outside of Boston. The most recent ordinance of the city allows us to take patients who are bona fide residents of Boston. We don't take patients on the basis of settlement, though the ordinance states that we give preference to citizens of Boston. The first ordinance had a two-year residence clause. That has since been modified so that we can take patients who are bona fide residents of Boston.

Dr. MILLET. As to the ability of an advanced case to sleep out of doors, I can say that for ten years at East Bridgewater our advanced cases have slept out of doors.

A few years ago we were very much interested in getting tuberculosis a registerable disease, and after a whole winter's work we were able to get that disease put among the registerable diseases. We thought that if we placed it alongside smallpox the Board of Health would immediately jump at the chance to do the same that they would with a case of smallpox. There are only a few boards of health in the State, as I understand it, that have lived up to their duty under that law. The city of Cambridge is one, and I would like to ask Dr. Stevens to give the reasons why they did it.

Dr. STEVENS. (Cambridge). Mr. Chairman, I can state that in Cambridge they have organized a day camp, and a permanent one, for the treatment of consumption.

I think the Board of Health of the city of Cambridge were induced to do this because they interpreted the law in a way which they felt forced them to do it. After some considerable delay the city government made an appropriation the build shacks and permanent buildings for the advanced cases. They are located in a very desirable location, near the edge of the town, where they have a very large open area. They have been running these camps, I think, about a year. They went through last winter with them. The camp has been more than full, and they are boarding some of their patients in other places. At the Holy Ghost Hospital the Cambridge Board of Health maintain quite a number, and in some other sections they have taken care of advanced cases. I think that the fact that they felt they were obliged to do it is what stimulated them to bring this desirable thing about.

The camp seems admirably adapted for its purpose. They have one large shack screened on the south side and with shutters on the north side, which can be lowered. In stormy weather they have screens of cloth which are let down and which keep out the dampness and the wind to a certain extent, and still allow a free circulation of air.

They are just now planning for the erection of a large contagious hospital on the same ground. They are going to put in a hospital for smallpox, scarlet fever and diphtheria. Up to the present time they have had no hospital for the treatment of scarlet fever, they have had no hospital for the treatment of diphtheria; but they are now working to get an appropriation of $100,000 from the city to erect a general contagious hospital, which is to be on the same grounds as the tuberculosis camp. It is at present under the management of the Board of Health, but there is a very decided feeling in Cambridge that this hospital should be under the care of a board of trustees. It certainly seems to me very desirable that it should be under a board of trustees rather than under the Board of

Health, and I think that is what is going to be brought about in Cambridge.

Dr. WINCHESTER (Lawrence). Mr. Chairman, the city of Lawrence has had an Anti-Tuberculosis League, which contracts bills, and the Board of Health reimburses them.

Dr. KENNEDY. In New Bedford we believe that we are not obliged to have a tuberculosis hospital. There is a private hospital there to which we send patients. Now, if it is necessary to have a tuberculosis hospital, I think it necessary to send every case there, even in its incipiency.

There is a question that I would like to ask here along the lines of education. We have in New Bedford a woman who has tuberculosis, and who is absolutely regardless of the health of others. She is in a family of six or eight. She scoffs at all hygienic precautions. We have sent our agent to her, and sent him yesterday to read the riot act and threaten her with isolation from her family. Are we going too far?

Vice-President DURGIN. There never has been any doubt with us as to the authority of the Board of Health under the Massachusetts law to move a case of consumption the same as we would move a case of smallpox. The authority is in fact greater in favor of consumption than of smallpox, for there is a little string with regard to smallpox and none with regard to any other infectious disease.

I would say, now that this question has gone so far that the boards of health are just a trifle under challenge, that I know of one board that moved eight years ago very strenuously to create hospital accommodations for consumptives. They found a place ready to be seized and

made use of, and went to the city council with an urgent request, backed well by the best talkers in the council, and asked for $40,000 with which we could have prepared over 200 beds and had them all ready to be occupied in five weeks. The Board of Health and the consumptives were beaten by political and real estate eloquence. Other strenuous efforts were made by the same board, aided by the best men and women of the city, but we were beaten again. $150,000 was appropriated by the city council for the care of consumptives, but with due care not to place it at the disposal of any board, committee or any living person, and thus it slumbered for years. I went to the chief executive with a warrant for $200,000 to be added to the $150,000 to start the thing by somebody, — anybody who would be satisfactory to the government, — and was told it was not enough, that we must have $1,000,000 before we started. Thereafter all manner of means were used by the Board of Health to move the government, but without success. Finally a board of trustees was appointed and given charge of the slumbering $150,000. That board of trustees has done good work and worked as fast as its appropriations would permit.

My board has taken consumptives who could not be properly cared for at home, and as soon as it could find a bed or a suitable place, has put one of them in it. We have never had beds enough. Conditions are now in much better shape, thanks to the action of the State of Massachusetts and our very useful board of trustees.

This much for one board. Let us hear from others.

Dr. McGRATH (Salem). The Board of Health of Salem maintain in their contagious hospital a large ward devoted to the care of consumptives. They have there at the present time seventeen patients. They have also furnished for the past two seasons to the Associated Charities of the city, which maintain a day camp at a place called

Fort Lee, about a quarter of a mile beyond the contagious hospital, dinner for the patients at the camp. They have bought the dinner, cooked it, and delivered it to the camp.

Dr. Field, the chairman of the board, this past year instituted a campaign of education through the newspapers. The board paid for the space to publish his letters. That was done for the reason that he desired to obtain a particular portion of the paper, which practically everybody would see and read. He then, through the kindness of the owner and editor of the paper, obtained from them the right to have published there what he termed The Consumptive's Letter Box, and there were published in that several questions and answers. Many of you gentlemen perhaps have received that in booklet form. These he had printed afterwards, containing all the material published in the press. He considers this the ideal way of educating the public in this question. We have several hundred copies in the office; if anybody is desirous of obtaining copies we will be glad to furnish them.

Dr. VIETOR. The community is being so well educated on the subject of tuberculosis that gradually a consistent system of control of tuberculosis is being worked out experimentally.

I think we all recognize that the first essential in every community is to locate the cases of tuberculosis. It follows from that that the first logical step, as has been brought out by the Chairman, is the registration of tuberculosis. The next practical step, after cases are recognized, is to determine what to do with them, and the various phases of that problem have been brought out in the different papers this afternoon. Personally, I have thought of one point that it seems to me I should be inclined to emphasize in the controlling of the cases of tuberculosis after they were discovered. I think the cases

should be classified first as "closed" and "open," and I think that the local control would be perhaps most useful along those lines. All cases of tuberculosis originate with previous cases of tuberculosis who are discharging bacilli. Consequently from the point of care of prevention the cases which require the greatest seeking out and the most sedulous care are those which are discharging bacilli. Second, we know that cases which are "closed" may at any time become "open" or discharging cases. It seems to me that I should perhaps be a little more inclined to emphasize the constant supervision of the cases which are "closed," so that as they become, or if they become, "open" they would come under preventive control.

Dr. WINCHESTER. Mr. Chairman, as a member of the Executive Committee of an Anti-Tuberculosis League, I would like to report that a year ago at our request the city government appropriated $14,000 for the establishment of a hospital for tuberculosis patients. A board of trustees was appointed by the mayor and this year the appropriation has been increased to $28,000. The hospital will be opened for patients the first of the new year. The maintenance of it I suppose will be taken care of by the city government under its board of trustees.

Dr. COX. In answer to a question I would say that we do not supply special cars for the transportation of patients to the day camp, they go with the general public. These patients are supplied with bags or paper napkins, in which to spit, and in my opinion they are not a source of any contagion in travelling in the cars to and from the camp.

Mr. RICKARDS. I would like to ask if any opposition was made by those living in the neighborhood selected for the camp or the out-door school to the establishment of the camp or the school near their houses.

Dr. COX. In regard to the camp I can say that at the time of the purchase of the property at Mattapan for the consumptives' hospital the immediate neighbors did not object. In regard to the school at Franklin Park there were some minor objections, but when it was called to the attention of these objectors that consumptives were going into the part of the Franklin refectory building which was set aside for the library, and using it as a reading room, the objections to the school, as far as children attending it was concerned, soon disappeared.

Dr. STACK. I would like to ask whether any towns have sent cases to Rutland and paid for them through the Board of Health appropriation.

Dr. CHASE. That was done in Brookline, to my knowledge, a few years ago, but the board of the patient was paid from the appropriation for the Poor Dept. It is not done any longer, our Anti-Tuberculosis Society paying the board of such patients at Rutland.

Dr. STACK. Any other towns besides Brookline?

(Representatives of the cities of Lowell, Brockton, Salem and Taunton and the town of Leominster replied that it had been done there. The representative of Leominster added: "The town of Leominster has a patient at Rutland it is paying for at the present time.")

Dr. STACK. The town to which I belong has had advanced cases, which of course the sanitarium will not admit. We find it costs over twice as much, and it has been a means of reducing our little appropriation quite a bit. I would like to know what other towns had done with their advanced cases.

Dr. CHASE. Mr. Chairman, in my town we take care

of the advanced cases in our own Board of Health hospital or in the neighboring hospitals where we get them admitted. I find comparatively little trouble in disposing of the women patients, but there is more trouble in disposing of men patients. The only patients with advanced consumption we have taken at our hospital were men patients. It is a rather small building, and it is not convenient to have both men and women there. We usually send the women patients to the House of the Good Samaritan or other hospitals in Boston.

Mr. WILSON. Someone asked if we had done anything in the way of establishing night camps. You have heard that both the day camp and the out-door school were started by a private association and afterwards taken up by the city. At the present time that private association is spending a good deal of its energy in developing a Night Camp for "arrested" cases that have come home from the sanatorium and would return, if no other provision were offered them, to unhygienic and improper surroundings in Boston.

We have had given to us within the last six months a tract of twenty acres of land in Mattapan, just within the city limits, and there are developing a boarding camp for patients who are cured. Men who are working through the day at their regular occupations spend their nights with us where they receive a minimum amount of supervision, but good food and good care. They pay $4 a week for their board, but of course this does not cover the expense to us. The camp has been running but a short time and must be considered as still in the experimental stage.

Another question was asked of Dr. Floyd, I think, at the beginning, as to what we are doing with all these 5,000 school children who have tuberculosis. Of course his paper showed that we were caring for relatively few of them

in Boston; but we are getting at this great group of cases among children in various ways. We are urging the establishment of school rooms in the different school buildings throughout the city. I think the latest building that is being put up by the Schoolhouse Commission has provision for an open-air room. Then, again, some of the principals and medical inspectors have become interested in this, and in one instance particularly have put a group of twenty or thirty children out of doors, using just the yard about the school building. So we are attempting to meet this problem in several ways.

I have in my office a number of reports of the efforts that have been made in Boston and in Providence in caring for children in out-door schools, and would be very glad to mail such a report to anyone who would like to have it.

PERSONAL HYGIENE.

By PERCY G. STILES, Ph.D.

Instructor in Physiology, Massachusetts Institute of Technology

EMOTIONS AND THE DIGESTIVE PROCESSES. A paper of unusual interest summarizing our knowledge of this subject has recently been published by Dr. W. B. Cannon.* We are indebted to this author for some of the most fruitful studies of the past decade concerning the movements of the alimentary canal and their nervous regulation. No one is better qualified to estimate the extent to which mental states may influence secretion, peristalsis, and ultimately nutrition. He has himself given us the classic observation that the movements of a cat's stomach are arrested when the animal is distressed or enraged. This demonstration ranks with Pawlow's proof that unless the diet contains stimulating substances belonging to a very limited class the glands of a dog's stomach secrete only when the food appeals to the appetite.

To these two familiar facts Dr. Cannon adds others gathered from the recent literature and not yet incorporated in the text-books. Modifications of the old experiments have now shown that the disturbing effect of transient excitement may last much longer than one would suppose. The sight of a cat may pervert the working of a dog's nervous system to such an extent that no gastric secretion will occur at the next feeding though the dog

* "The Influence of Emotional States on the Functions of the Alimentary Canal." American Journal of the Medical Sciences. April, 1909.

may be hungry and the cat apparently forgotten. Such a suspension of movement and secretion may occur when there is little show of excitement and when the existing cause seems to be trifling. The alimentary canal of a rabbit may be kept from its normal working by mere handling of the animal.

How far are the conditions in the human digestive system parallel with these which have been so often studied in the lower animals? There is an increasing body of information furnished by practitioners and showing that on the whole we can assume a close correspondence. Yet allowance must be made for the more variable and complex character of human emotions. A highly instructive case is that reported by the Scandinavian physician, Hornborg. His patient was a four-year-old boy with a gastric fistula which permitted the measurement of the juice secreted by the stomach wall. Food was shown to the child with the expectation that pleasurable anticipations would be roused and that a flow of gastric juice would occur. The result was quite otherwise. Instead of an emotion of pleasure there was evoked a lively vexation that the food was being withheld. Gastric secretion did not begin. Indeed, as is shown by the related observations of Bogen, the effect of such a trial is to depress the activity of the glands for some time afterward and even when the food is eaten. An intelligent adult, understanding that the coveted food would presently be within reach, would probably give the reaction which so signally failed with the impatient child.

Total arrest of gastric digestion and retention of the stomach contents for twelve hours or more were demonstrated in one case cited by Dr. Cannon where the emotional factor was found in the humiliation brought upon a sensitive woman by her husband's intoxication.

It is pointed out that a disturbance of digestion which is primarily due to mental conditions may be perpetuated

and intensified by other causes. If digestion is delayed and the advance of the food along the canal is hindered by the nervous state, harmful fermentation may set in. Toxic products may then continue to make trouble for the individual, both by local irritation and by their widespread effect when absorbed. It is easy to see that repeated shocks to the nervous system or continued worry may soon secure a chemical ally in their assaults upon the victim's health.

VETERINARY HYGIENE.

By W. L. BEEBE, D. V. M.

Bacteriologist for the Minnesota Live Stock Sanitary Board

OCCULT TUBERCULOSIS OF BOVINES. The fact that tubercle bacilli have existed in lymph glands of man without producing macroscopic lesions was first demonstrated by Loomis in 1890. Since that time many other observers have verified his results. In veterinary medicine the question of occult tuberculosis has been raised by researches into the duality of human and bovine tuberculosis and antituberculous immunization of bovine animals, and the methods of entry of the tubercle bacillus into the body, and it deserves to be studied not only in cases of experimental infection but also in animals naturally infected.

Valeé* has recently published an article on occult tuberculosis in which he calls attention to the fact that not infrequently tubercle bacilli are found in the lymph glands after cattle have been vaccinated by the von Behring method.

Ligniéres first established the fact that in animals vaccinated eighteen months previously, the bacilli may be found in the lymph glands that are apparently quite free from tuberculous lesions. These organisms probably represent the remnants of the inoculation carried out as a preventative measure. The fact that these glands contain virulent tubercle bacilli shows that the vaccination of bovines with even at attenuated culture introduces a cer-

*Journal of Comparative Pathology and Therapeutics. Vol. XXII. Part 2, pp. 133-140.

tain element of danger. The ordinary conception of vaccination is that the animal is rendered immune and that there are no live bacilli remaining. As the human type of germs are used there is a possibility of infecting man either from meat or perhaps milk. This can not be disputed.

Joest, Noack, and Liebrech* were able to demonstrate the organisms in the intramuscular glands when the lesions were confined to the thoracic and abdominal organs. This raises a question for the meat inspector to decide. Perhaps the fact that these occult lesions are occasionally due to commencing tuberculosis and that animals so affected give a typical reaction to tuberculin may account for the very small percentage of inaccuracy of tuberculin.

TUBERCLE BACILLI IN THE BLOOD OF TUBERCULOUS CATTLE. Since Rosenberger announced his startling statement that tuberculosis was a bacteriemia instead of a localized disease several workers in human medicine, namely, Ravenel and Smith, Burnham and Lyons, and others have brought forth evidences that does not verify his results. Brem has shown that acid-fast bacilli were contained in the distilled water that he used in his work. He at first mistook these organisms for tubercle bacilli, but later discovered the error and suggested that it might have been a source of error of other workers.

Recently Schroeder and Cotton* have reported the examination of the blood of 42 tubercular cattle and utterly failed to find tubercle bacilli present. The cattle used for the experiment represent practically all stages of the disease from mildly affected recent cases to old and completely generalized cases. They injected 3 c. c. of blood from each tuberculous animal intra-abdominally into a

*Untersuchungen zur Frage des Vorkommens Latenter Tuberkelbazillen in den Lymphdrüsen des Rindes und Schweines. ("Zeitschrift für Infectionskrank des Haustiere." T III, 1907, p. 257.)

*Bul. 116, Bureau of Animal Industry, U. S. Dept. of Agr.

guinea pig, using in all 95 guinea pigs, and also stained smears from the blood.

Dr. John R. Mohler, Chief of the Pathological Division of the Bureau of Animal Industry, U. S. Department of Agriculture, independently of Schroeder and Cotton examined the blood of 8 cattle by microscopical examination and by injecting the blood from each animal in 5 guinea pigs, using in all 40 pigs, but failed to find the tubercle bacilli present. The microscopical examinations and injections were made precisely in the same manner described by Dr. Rosenberger. It would seem as though the results of these experiments show quite conclusively that tubercle bacilli are not contained in the blood of tubercular cattle.

TUBERCULOSIS IN RANGE CATTLE. The impression is very widespread that an active outdoor life will not only prevent, but cure tuberculosis both in the human and the bovine. At the sixth International Congress on Tuberculosis Dr. Geo. S. Baker presented a paper on this subject in which he says, "The amount of tuberculosis in range cattle reaching the abattoirs at this point (San Francisco, Cal.) proves conclusively that outdoor life alone is not sufficient to either prevent or bring about a cure." He quotes figures to show that on one range where the animals were kept under ideal conditions, the disease increased from .9 of 1 percent to 9 percent in five years and that probably none of these animals were even inside of a barn.

At the same Congress Dr. M. E. Knowles of Montana asserts that cattle are very rarely affected with tuberculosis where they are kept under open range conditions. The marked discrepancy in the reports of these two men might be accounted for as follows: In California while the cattle are never put in barns, they are many times turned into alfalfa fields which would necessitate their coming in more or less close contact with one another. If they were affected

with open tuberculosis and were coughing, the germs might easily be expelled on the ground or if the sputum was swallowed, they would be discharged with the feces. When the germs are once on the grass, it is a very easy matter to infect other members of the herd. In Montana conditions are different. Under strict range conditions the animals are not confined at all. They roam over plains that are sparsely covered with vegetation and do not come in close contact with each other. It would seem as though in order to determine the point as to whether tuberculosis spreads under strict range conditions the only way to do would be to observe a herd of cattle part of which was known to be tuberculous and see if the disease spread to non-tubercular animals.

MUNICIPAL SANITATION.

By CHARLES V. CHAPIN, M. D.
Superintendent of Health, Providence, R. I.

INSPECTION OF HOTELS, RESTAURANTS AND LUNCH CARTS.* Dr. Buehler has recently undertaken the inspection of hotels and similar places with the view of improving their sanitary condition. For the purpose of facilitating this work he makes use of a score card, somewhat like those used for scoring dairies, and in this scoring he attaches twice as much importance to methods as to equipment. Scores were published in the daily papers, and, as a result, a very healthy rivalry was created between the different establishments. Out of 108 hotels, restaurants and cafes inspected, orders for improvement were issued to 108; of 20 lunch wagons, 19 were ordered cleaned.

ISOLATION IN HOSPITALS. While the theory of infection by air still dominates American methods of isolating cases of contagious disease, the English are placing less emphasis upon air infection, and more upon contact infection. In the Report on the Health of the City of Manchester, 1908, page 153, Dr. A. Knyvett Gordon, superintendent of the Monsall Hospital, described the method which has for several years been in use in that hospital, for the isolation of individual cases from the rest of the patients. He says: " It is now abundantly clear that structural separation of the cases is not the most important point, infec-

*Report of the Department of Public Health and Charities, Indianapolis, 1908, pp. 6, 90.

tion being carried — as it is — mainly by hands, clothing and utensils (including toys), and not to any extent by the air of the ward. Consequently, it does not, in practice, suffice to place patients in separate small wards, so long as they are attended by the same nurse, who takes no special precautions, and relies on the separation afforded by the walls or partitions. If the patients in different small wards are treated by the same nurses, they might just as well be in one common ward, except for the sake of appearance." Dr. Gordon states that it is the custom to treat in the general wards cases admitted with doubtful diagnosis and often those suffering with a combination of infectious diseases. In the Monsall Hospital in 1908, 1,763 cases of scarlet fever were treated. Over one hundred cases were admitted for scarlet fever, but did not prove to be such, and these, together with mixtures of scarlet fever with diphtheria, measles, chicken pox and whooping cough, were treated in the scarlet fever wards by the method described below, with no untoward results, except in one instance where there was a delay of half a day, owing to a mistake in orders.

The method of isolation is as follows:

The patient's bed in the general ward is surrounded with a screen covered with sheets, which are kept constantly wet with a weak solution of some disinfectant. The main purpose of this screen is to serve as a label, and to remind the nurses that certain precautions must be taken for the patient behind it. At the same time, I think the wet sheets may possibly arrest infected particles that are projected against them in the act of coughing or sneezing. The only other requisite are two glass shelves fixed on the wall behind the bed, and a locker or portable cupboard made of metal, with an enamelled surface, which can be easily disinfected and kept clean.

The precautions to be taken by the nurses in attending

patients behind this screen or "barrier" are printed on a card fixed to the screen, and are as follows: —

Precautions to be Observed in the Nursing of Barriered Cases.

(1) Rubber gloves are to be worn by the nurse for all manipulations connected with the case, including the handling of clothes. The gloves are to stand in a bowl of 1 to 400 Izal solution.

(2) The following utensils are to be marked and kept on the glass shelves or in the locker provided: —

Spatula, Nozzles, Clinical Thermometer; to be kept completely immersed in 1 in 400 Izal solution.

At least two bowls.

All feeding utensils (plates, spoons, forks, etc.).

(3) A plentiful supply of wet swabs, with a bowl containing Izal solution to receive these when used, is to be kept on the locker. Handkerchiefs or muslin squares are not to be employed.

(4) No toys or books that have once been used inside the barrier are to be taken outside it except to be destroyed.

(5) In every case a square of jaconette is to be placed on the pillow-slip, and over this a piece of muslin; the latter is to be renewed whenever soiled.

(6) An overall is to be worn by the nurse when either the patient or the clothes are handled. This is to be kept inside the barrier.

It is said that the "Patients so treated are more easy, and not more difficult, to nurse." In one of the wards a glass screen was used for a "barrier," but was not satisfactory, as the patient was often somewhat frightened, and it took a good deal of time to keep the glass clean.

It is the custom at the Monsall Hospital to irrigate the throat and nose of every scarlet fever patient with tap water, and since the nurses have worn rubber gloves while doing this, post-scarletinal diphtheria has become a negligible quantity.

CONSOLIDATION OF INSPECTION SERVICE. In New York* school inspection, the general inspection of contagious diseases, and public vaccination were carried on by different officials. Now one inspector performs all these functions in his own district, of course, having a smaller district. The change is found to be a great improvement.

Whenever a case of contagious disease is reported to the health department by a physician its receipt is acknowledged and literature is sent to him containing the rules, and a statement of what is being done by the department. This results in keeping the physician in much closer touch with the work of the health department.

CLEANSING OF MILK RECEPTACLES.* A rule was adopted February 19, 1907, requiring that all the receptacles used for milk or cream must be immediately cleaned upon emptying. An active inspection of dealers was carried on to enforce this law, and 112 arrests were made for its violation. In order to educate the public many of the dealers were induced to have printed upon the paper caps of their milk bottles the following: "This bottle must be washed as soon as emptied, by order of the Board of Health."

*Report of the Department of Health of the City of New York, 1907, page 14.

†Report of the Department of Health of the City of New York, 1907, page 146.

SANITARY ENGINEERING NOTES.

By ROBERT SPURR WESTON

Assoc. M. Am. Soc. C. E.

THE SEWAGE DISPOSAL PLANT IN FRANKFORT-ON-THE-MAIN.* A very complete account of the past and present methods of disposing of sewage at Frankfort and of various experiments which have preceeded various types of construction employed in the works.

The sewers of Frankfort were begun in 1867. The first plant consisted of four precipitation tanks, each 82.4 m. long and 5.5 m. wide, into which the sewage ran from an inlet conduit 6 in. long, first receiving a sufficient quantity of lime and sulphate of alumina to affect the precipitation of the suspended matter. A grit chamber preceded the inlet conduit; the latter was so large that it must be cleaned every four weeks. The cost of operating the works during 1901 was $0.134 per capita and the cost of chemicals $0.041 per capita per annum. Between the years '88 and '02 more than 700,000 cu. m. of sludge were removed from the sewage, an average of 77,000 cu. m. yearly. The works became too small and their operation too costly, and especially troublesome was the frequent cleaning of the inlet conduit, because the dirty water must be discharged into the River Main. The new works were built between 1903 and 1905. Experiments had shown that the old basins were unnecessarily long, so they were cut in half and made 40.4 m. long, and the plant was rearranged in basins each 40.4 m. long,

*Dr. J. Tillmans. Wasser und Abwasser, 1, 305-322.

and so that there were seven pairs of basins arranged on the sides of the inlet conduit. The breadth of the inlet conduit was reduced to 8.8 m., which discharged into the grit chamber, the latter 2.85 m. deep. Beyond the grit chamber are three automatic rakes of the Uhlfelder type. These rakes, which have a diameter of 6 in. and a breadth of 2 in., resemble in construction wheels with 5 shovels on the circumference of each wheel. These shovels consist of- rake teeth placed 10 mm. apart. The rake teeth are moved by the revolving wheel against the stream of sewage and raise the coarse suspended matter out of the stream. The brush takes off the accumulated matter onto an endless belt which discharges into the wagon. The sumps beneath the precipitation tanks are arranged so that the sludge may be pumped off by itself with a minimum of sewage. The construction also provides for a very quiet entrance of the sewage, thereby causing little disturbance of the sludge. The clarified sewage discharges into the Main through an outlet conduit. The cost of rebuilding the whole work was about $400,000. The yearly operation cost is as follows:

Operation	$0.185
Interest and Depreciation	0.060
Sinking Fund	0.012
Administration	0.024
Total cost per capita per annum	$0.281

There is an interesting account of experiments and investigations made between 1887 and 1900 by Lepsius Popp Becker and Freund.

Parallel experiments with chemical and purely mechanical treatment give the surprising result that the advantage of using chemicals was very doubtful, also almost as good a removal of the suspended matter could be obtained by mechanical means. This was also true of the dissolved

matter. Experiments also show that basins 82 m. long could be cut in half to advantage. Experiments with mechanically purified sewage on contact filters were made, but it was not believed the additional purification effected would be worth the cost of construction and operation. Tests of the River Main show that the number of bacteria in the river water below the sewage disposal plant was not markedly affected. Extensive experiments were carried out with the rebuilt works and the records of operation are very complete. Generally speaking, the works removed about 89.4 per cent..of the total suspended matter and 86.4 per cent. of the organic matter. When the effluent was diluted with five parts of the Main water it was non-putrescible. The disposal of the sludge received a great deal of attention, the plant removing from 20 to 30 cu. mm. by grit chamber and rakes, also from 200 to 250 cu. m. by the basins. The sludge contains 91.07 per cent. of water, and in the dried substance there is 43 per cent. of mineral matter and 57 per cent. of organic matter, the whole latter including 17.06 per cent. of fat. To disinfect and cover the sludge the authorities have used turf and peat products. Experiments with filter presses were not a success, but on the contrary centrifugal machines have given very satisfactory results. The so-called schleuderapperat (slinging apparatus)* which is in use in Harburg and Hanover was given a thorough trial at Frankfort. An investigation was made into the feasibility of drying the sludge by electro-osmotic methods, and laboratory experiments will be repeated on a larger scale. The sludge dried in centrifugal machines will be subjected to a further drying in the drying apparatus, mixed with refuse, and burned in a garbage crematory. This apparatus will be in operation in less than a year. The sludge containing from 30 to 40 per cent. of dried substance will be taken by farmers for fertilizer. A certain

* " Reichle und Thiesing, Mitteil, d. Konigl. Prufungsanst. f. Wasservers, u. Abwasserbeseit. 1908, H. 10.

part of the sludge will not be dried, but will be piped to certain near-lying fields. Experiments show that the putrid sludge contains 1.76 per cent. nitrogen and 2.04 per cent. of phosphoric acid. This means that 100 lbs. of sludge is worth about 23 cents as fertilizer. Bechhold showed that the scum on the basin contained from 80 per cent. of fat, and experiments were made looking to the recovery of this by means of benzine. This process does not seem to be practical from the evidence on hand at present. One hundred carloads of sludge can be made to produce 20 cu. m. of gas, which is over 3,600 to 4,000 W. E. per cubic meter. This gas is an excellent fuel gas of low illuminating power. A number of references accompany the article.

OPERATION OF THE INTERMITTENT WATER FILTERS AT THE LUDLOW RESERVOIR, SPRINGFIELD, MASS.* A description of the construction and history of three years operation during the summer months. These temporary filters were built without cement or artificial floor of gravel washed from the bank sand and covered with sand of an effective size of about .30 mm. The underdrains were of tile with open joints. The essential feature of the filters was their intermittent operation and thorough aeration before and after filtration. The water to be filtered came from a very muddy reservoir and contained many organisms of which asterionela caused particular trouble because of its cementing action upon the surface sand which necessitated frequent raking between the usual scrapings and cleanings. In 1907 anabaena was very abundant but caused very little trouble until after death when it clogged up the beds rapidly. Coelosphaerium was also abundant at times but the water was satisfactorily purified in spite of these during practically all the time that the filters were in operation. One especial cause of trouble was heavy ruin during cleaning

*C. F. Story. Eng. News, 61, 301-3, Mar. 18, 1909.

of the beds. This would not only redirty the bed but caused surface hardening which could not be broken with a rake. The process of raking consisted in drying out the bed over night and part of the day and then breaking up the surface thoroughly with heavy rakes. A bed so treated gave as good a water as one newly cleaned and the dirt penetrated very little deeper although the subsequent scraping was made a little heavier. This process was not generally employed in the presence of anabaena or more than twice between scrapings but was found especially efficient in the presence of asterionella. The beds were scraped by collecting the dirt in rows with hoes and then removing in wheelbarrows. The average cost of operation of the filters during three years was $3.73 per million gallons of water and the entire cost of construction was $50,724.

THE MINERAL ANALYSIS OF WATER FOR INDUSTRIAL PURPOSES AND ITS INTERPRETATION BY THE ENGINEER.* An interpretation for the benefit of the engineer of industrial water analyses expressed in ionic form in parts per million. Explanations and formulae are given for calculating the cost of water softening and for determining the value of a water for boiler use.

THE WORK OF BOARDS OF HEALTH.† The author points out in a general way the duties of boards of health, in collecting vital statistics, suppressing communicable diseases, and determining and suppressing nuisances. He calls attention to the importance of educating the public, medical authorities and health boards in regard to the causes and transmission of disease, the need of establishing laboratories to assist the health authorities, and finally the de-

*H. Stabler, Eng. News 60, 355-71, Oct. 1, 1908.
†G. A. Soper. Eng. News 60, 606-8, Dec. 3, 1908. Discussion by M. N. Baker.

sirability of taking public health work out of the political field. The discussion suggests the advantages of a national health board.

A NEW REFUSE DESTRUCTOR FOR WEST NEW BRIGHTON, BOROUGH OF RICHMOND, NEW YORK CITY.‡ This destructor is constructed on the type developed in Great Britain for treating mixed household refuse of ashes, garbage, etc. The garbage wagons dump directly into hoppers from which the refuse is shoveled by hand onto the grates. After a certain amount of clinker has collected it is withdrawn while hot and falls through trap doors into a cooling chamber through which the air for combustion passes. After sufficient cooling the clinker is removed in wheelbarrows. The gases from the combustion pass over the successive grates, mix, and are oxidized in a combustion chamber and then pass into a boiler and thence to an air heater outside of which circulates air for combustion. From the heater the gases pass to the chimney. The destructor is working satisfactorily and promises to continue to do so. The steam power generated has not yet been utilized. The cost of construction was $68,495. The operating cost can not be determined until the plant has completed a year's work. Further details of construction are given.

WATER SUPPLY OF PHILADELPHIA WITH SPECIAL REFERENCE TO THE FILTRATION WORKS NOW UNDER CONSTRUCTION.* This article is mainly an exposition of the bad water situation in Philadelphia and criticism of the means employed to remedy it. Experimental meters installed in twenty houses showed that sixteen used an average of 30 gallons per capita per day while the other four used an average

‡J. T. Fetherston, Eng. News. 60, 485-7.
*J. C. Trautwine, Jr. J. Frank. Inst. 166, 363-94 (Nov.).

of 49 gallons. This leads to overworking the plants, use of insufficiently purified water and constant shortage of supply. The city is opposed to meters and so is enlarging its plant at tremendous cost to meet the unnecessary demand. The water is taken from the highly polluted Schuylkill and the much purer Delaware Rivers. The present improvements involve diminishing the proportion of water taken from the former river and purifying all the water by slow sand filters preceded by gravel and coke "scrubbers." The cost of construction approximates $28,250,000 and the works are expected to have a capacity of 340,000,000 gallons per day — rather less than the demand. Other engineering details are given in rather disconnected form.

PURIFICATION OF PEATY WATERS BY FREEZING.† Chemical analysis of ice and water from the Ottawa and Rideau rivers shows a large degree of purification during freezing. The impurities of these rivers are largely organic. The albuminoid ammonia is reduced about four-fifths and the total solids which are about half organic are reduced from 56 and 145.2 P. P. M. to 4.4 and 5.4 P. P. M. A separate experiment in which 875 cc. of a 1000 cc. sample of Ottawa water were frozen out in a basin gave confirmatory results.

H. R. HOSMER.

THE "SUCROFILTER."‡ This filter is supposed to be made of selected asbestos treated by "special processes" which gave it a laminated structure of a peculiar kind such that it will remove practically all impurities, even microorganisms, from almost any liquid and never stop up. It is especially valuable, made up in divers forms in water purification, for filtering wine, spirits, perfumes,

†Shutt, F. T., Chem. News. 97, 270-1, June 5, 1908.
‡C. Wolters, Z. Angew. Chem. 22, 865-67, May 7, 1909.

petroleum and in all cases where it is desirable to regain the sludge. The article reads like an advertisement.

H. R. HOSMER.

MAIN DRAINAGE OF THE METROPOLIS (LONDON).* A description of the sewerage situation in 1856 and of the methods since employed to remedy it. In 1856 London was discharging her sewage into the Thames through a number of large drains made by roofing over some of its small tributaries. These drains had originally been intended for surface water only and had only been gradually converted into sewers as circumstances forced it. Owing to their slight fall they could only empty at low tide and in flood or heavy rainfall they backed up into the basements, etc. To prevent this was the first consideration when Sir Joseph Bazalgette took up the work. He was practically forced by financial considerations to use the existing drains but he had them discharge into a series of intercepting sewers conveying the sewage by pumping to Barking and Crossness on opposite shores some eleven and thirteen miles down stream. The sewage from the higher lying areas was conveyed by high and middle level sewers to Abbey Mills and thence to Barking. A similar system was used on the south side of the river. These sewers provided for a total flow of about 800,000,000 gallons a day, but it proved necessary to still discharge the rainfall floods through the old outfalls. It is now evident that new intercepting sewers must be built for this purpose since the street washings are very offensive. For several years after the completion of this sewerage system all the London sewage was discharged directly into the river. Then it became necessary to treat it before discharge and this is done by precipitation with 1 gr. of $FeSO_4$ and 4 grs. lime per gallon. The sludge, containing 92% water, is pumped into special steamers

*Edit. Eng. 87, 701-3, May 21, 1909.

for conveyance to the Black Deep in the estuary. The supernatant liquid is discharged into the river which is in a reasonable state of cleanliness. The amount of sludge now shipped averages 8200 tons per day and the average daily flow in 1908 was 283,000,000 gallons, increasing during storms to 1,008,000,000 gallons. The annual working costs at Barking and Crossness come to £118,180, of which £4,000 is due to the sludge steamers. The population is 15,136,192. The old system was designed for a population of 3,450,000. Several important new storm-relief sewers, intercepting sewers and outfall sewers, have been constructed (or are being constructed).

H. R. HOSMER.

THE SMOKE NUISANCE.* This note calls attention to a report of the Syracuse Chamber of Commerce which opposes a policy of fines and ordinances and recommends the study by the fuel users of the prevention of smoke formation according to the following rules:

Gases must be distilled from the coal at a uniform rate and must then be brought into an intimate mixture with sufficient hot air in a fire chamber to burn them completely. They should not then be allowed to come into contact with the comparatively cold boiler surfaces until completely burned, that is, they should have sufficient space and time for complete combustion.

H. R. HOSMER.

STERILIZATION OF POTABLE WATER BY THE MERCURY ARC IN A QUARTZ TUBE.† The author claims to have sterilized completely in 1 to 2 minutes very much polluted waters with the ultra-violet rays from a mercury arc in a quartz tube. With the Kromayer lamp (4 amps., 135 volts) the bacteriacidal action was very

*Anon. Eng. 85, 861.
†J. Courmont, and T. Nogier, Compt. Rend. 148, 523, Feb. 1, 1909.

intense at a distance of 0.3 m. from the tube. No details are given.

H. R. HOSMER.

FILTRATION AND PURIFICATION OF WATER FOR PUBLIC SUPPLY.‡ This paper gives a resume of the main features of water supply under the headings: Sources of Supply, Impounding, Filtration, and Distribution. Under filtration are given diagrams and full descriptions of the construction and the manner of working of the Jewell, Bell, Candy, Puech, and Reeves filters. The different methods of purification with ozone, ferrochlore, and iron, of water softening, and prevention of growth in mains and action of water upon the pipes are also discussed. (The article is of too general and descriptive a nature for further review.)

H. R. HOSMER.

A PLEA FOR A WIDER AND BETTER EXTENSION OF THE KNOWLEDGE OF SANITARY SCIENCE.* A popularized presentation of the need of the community for better sanitation, of air and water, and for better training of physicians, army and militia officers, engineers, nurses and finally of students in general along sanitary lines. In the State of New York during 1907 the deaths from alcoholism numbered 1,023 from typhoid fever 1,688 and from consumption 14,406 — yet the general agitation in favor of better air and water are quite lacking in contrast to the strong movement against alcoholism. This is a question which should be attended to by the State government, and that this may be effected the public in general must be educated to its needs.

H. R. HOSMER.

‡John Don, Eng. 87, 126-30: 160-3.

*W. P. Mason, Science, 29, 641-647. Founder's Day Address, given at Lafayette College, Oct. 21, 1908.

NOTE ON THE ACTION OF ALUM ON SCHUYLKILL WATER.* The author finds that the Schuylkill water will react with 9 grs. of crystallized ammonium alum per gallon. A series of tests, made on successive days, of the alkalinity of the water untreated, and after treatment with alum and forcing through a filter bed shows an almost constant uniformity in the raw water but a wide variation in the effluent. It is concluded that the filter requires more care. No details of the construction or operation of the filtering system are given.

H. R. HOSMER.

SEDIMENTATION OF WATER SUPPLY AND ITS RELATION TO TYPHOID FEVER IN WASHINGTON, D. C.† A detailed consideration of the condition of the water supply and the corresponding typhoid death rate from 1888 to 1905. During that time the water supply underwent several radical changes involving a variation of time of sedimentation from none to two days, but the typhoid rate does not show the expected fluctuations. Moreover, since the use of the filtration plant installed in 1905 the death rate has fallen but little. A comparison of the typhoid death rates of Washington and Richmond during 23 years shows a remarkable parallelism in spite of the great differences in their water conditions. The author concludes that there is some as yet undiscovered factor in the situation more important than the water supply.

H. R. HOSMER.

PIPE LINE AND PURIFICATION WORKS AND EXPERIMENTS OF THE BALTIMORE COUNTY WATER AND ELECTRIC CO.‡ A detailed description of the engineering side of the work concluded by the report

*Henry Leffman, J. Frank. Inst. 167, 312-314, May, 1909.
†Francis F. Longley, Eng. News, 61, 431-433, April 22, 1909.
‡A. E. Walden, Eng. News, 61, 283-287, Mar. 1909.

of some experiments upon the comparative efficiency of slow sand and mechanical filters, and the effect upon bacteria of ozone, hypochlorite of lime, and $CuSO_4$.

The mechanical filter is cheaper to install and more easily worked with waters that suffer sudden changes of turbidity, but in this case requires careful watching to insure the presence of plenty of alum in time to handle the high turbidity before it reaches the bed. The sand filter is more economical to operate and except with very high turbidities and bacterial counts, more efficient. At times the alkalinity of the water does not seem to be in a form suitable to react with alum when addition of mud or clay is necessary to bring the effectiveness of the mechanical filter up to that of the sand. For good results the mechanical filter must be run continuously after the blanket forms as starting or stopping disturbs it. Experiments with an ozonizer show that this method of purification is not economical with a water of high turbidity or organic matter, at least without previous use of roughing filters. 0.1 g. hypochlorite of lime added every other day and 0.7 g. alum per gallon produce a sterile water, and there are indications that these quantities can be further reduced with equally good results. The hypochlorite reduces also the quantity of water required for washing the beds. $CuSO_4$ fed into the underdrains of the filters keeps bacterial growth under control easily.

H. R. HOSMER.

CHEMICAL LABORATORY NOTES.

By FRANKLIN C. ROBINSON
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NEW DISINFECTANT. "Keramyl" is the name given to a 25 per cent. solution of commercial hydrofluosilicia acid in water, when used as a disinfectant. One-half per cent of this in water kills common bacteria and yeasts. It does not act very rapidly and such small dilutions require from 4-12 hours to do its work. Stronger solutions act more rapidly. It attacks iron and zinc readily, but has little action on copper or brass or tin.

ELECTROLYTIC DISINFECTANTS. There is a marked revival of the use of hypochlorites as disinfectants, especially in water and sewage, and stable disinfection. There is a tendency also to prepare these by electrolysis, from solutions of chlorides. Magnesium hypochlorite is preferred to calcium for various reasons, and now that magnesium chloride can be obtained cheaply, large quantities of this are changed by electrolysis to the hypochlorite for disinfecting purposes, especially in England. One of the Metropolitan Boroughs of London has a municipal plant for its manufacture, and has made and used for the last three years about 20,000 gallons a year, costing about $200 per year.

The greatest obstacle to the proper use of disinfectants in the United States, as elsewhere, is their excessive cost.

When efficient ones can be obtained for about one cent a gallon, as above, there will be a greater tendency to use them as they should be used in and around our dwellings. Of course, hypochlorites cannot be used in ordinary room disinfection without great care, owing to their bleaching action on colors and corrosive action on metals.

In an article published in the English Journal of Hygiene, 1908, 8, 634-697, some interesting experiments are given, showing that the more virulent type of an organism is less easily killed by a disinfectant than the less virulent; also that disinfectants of the emulsion type, that is, those which contain the tar acids and give milky solutions when diluted with water, are much lessened in their action by the presence of floating organic matter, such as dust, charcoal, feces. In such cases it is safer to use 50 per cent. more of the disinfectant than when such things are absent. Disinfectants which give clear solutions, as carbolic acid and formaldehyde, are much less affected by such organic matter, unless, as in the case of mercuric chloride, the disinfectant combines with the organic matter, as that does with albumen.

FLOUR BLEACHING. In the last number of this *Journal*, some account was given of chemical tests upon bleached flour made by the food commissioners of North Dakota. Since then, an article has been published as a bulletin of the Minnesota Agricultural Experimental Station, giving results of experiments tending to show that such bleaching is not deleterious to the health of those eating the bread. Attention is also called to the presence of small amounts of nitrates in the air, many waters, smoked bacon and ham, and such vegetables as celery and lettuce. This controversy illustrates again the necessity of hearing both sides before forming an opinion, a fact which is also brought to mind by the benzoate of soda discussion.

BENZOIC ACID. Whatever opinion we may have as to the merits of the question of the use of this acid or its salts in food, we are interested, as chemists, in the tests for it. One of the best of these is to distill some of the food, previously shaken up in water acidulated with sulphuric acid, extract the distillate with ether, and then evaporate the ether which contains any benzoic acid present. The ether residue is dissolved in warm water and treated with one drop of weak hydrogen dioxide, and then one drop of ferric chloride solution, and the containing tube immersed in boiling water. The characteristic violet color of salicylic acid into which the benzoic was converted by the hydrogen dioxide appears. The test was devised by A. Joneson, and given in Pharm. Chem. 1904, 48.

BIOLOGICAL LABORATORY NOTES.

By FREDERIC P. GORHAM

Associate Professor of Biology, Brown University
Bacteriologist, Providence Health Department

THE "SCRAPED TUBE REACTION" FOR THE SEPARATION OF THE MEMBERS OF THE TYPHOID GROUP. In the May number of this Journal we noted the "Scraped tube reaction" for the separation of certain members of the typhoid group of organisms and credited it to Chatterjee.* Since that time Dr. N. MacL. Harris has called my attention to the fact that this discovery of Chatterjee really dates back to the observations of Achard and Renault.† It was also used by Widal & Nobécourt,‡ by Cushing,§ and by Buxton.||

STERILIZATION OF SUGAR MEDIA. The question of the changes which various sugars undergo during the process of sterilization, has by no means been settled. The accuracy of the determination of the fermentative action of various organisms upon the different sugars is, of course, immediately dependent upon this question. This matter is discussed at some length by Elser and Huntoon in their "Studies on Meningitis."** They made use of the

*Cent. 8. Bakt. Erste Abt. Orig. XLVIII, 1908. 246.
†La Semaine Medicale, 1898, pp. 136 & 512.
‡La Semaine Medicale, 1897, p. 285.
§Johns Hopkins Hospital Bulletin XI, 1900, 166.
||Jour. Med. Research III, 1902, 206.
**Jour. of Med. Research, XX, 1909, 403.

fermentation test for the purpose of finding a ready and reliable means of differentiation between the meningococcus and other Gram negative cocci.

These authors first refer to the difficulties which they found in securing pure sugars. They found it necessary to supplement the results obtained by using Kahlbaum and Merck products by additional tests with sugars derived from other sources.

The proper sterilization of the sugar media was found to be difficult, and improper sterilization would lead to discordant results. A ten per cent solution of the sugar in distilled water was sterilized at 100°C for ten minutes and added to the medium prepared and sterilized as usual. Great difficulty in thus sterilizing certain kinds of sugar solutions was found, notably in the case of inulin. Some of these products contain very resistant spores which were not destroyed by the above method nor by the usual fractional sterilization. These spores germinated slowly and their presence was not suspected until the culture had been at incubator temperature for several days. The growth of these and similar spores may account for some of the discordant results of other observers. Similar experiences have been noted by Hiss* and by Norris and Pappenheimer.†

The authors also tested the suitability of various liquid media for the sugar test and then refer to the use of solid media in plates as suggested by von Lingelsheim‡ or as agar slants as lately suggested by Sherman and Ritchie.§ The complete description of their methods of preparing these agar slants with various sugars and their methods of sterilization is given on p. 406 of their paper.

In Science XXI, 1905, 481, L. A. Rogers described a method of using the cavity of a concave slide for fermenta-

*Jour. Exper. Med. VII. 1905, 547.
†Jour. Exper. Med. VII, 1905, 450.
‡Klin. Jahrb. XV, 1906, H, 2.
§Jour. Of Path. and Bact. XII, 1908, 456.

tion tests, thus making use of small amounts of the sugars and making it possible to test a long series of sugars with little trouble. This method is of advantage for the reason that the various sterile sugar solutions may be kept on hand ready for use.

It will be remembered that "Standard Methods" as amended by the Progress Report of the Committee at the Winnipeg meeting recommend that all sugar media be sterilized in the autoclav at 120 C for ten minutes and that the sterilizer be hot when the media are introduced, and that the media be cooled rapidly. Unless these precautions are observed lactose media will give positive tests for gas formation by gas forming bacteria which ferment dextrose but do not ferment lactose. The length of time that a sugar is treated and not the temperature seems to be the important factor in inverting the sugar.

PUBLIC HEALTH LEGISLATION, NEWS AND NOTES.

By F. H. SLACK, M. D.
Director, Boston Board of Health Laboratory

THE COMMON DRINKING CUP. The Kansas State Board of Health in a regulation effective after Sept. 1st, 1909, forbids the use of the common drinking cup upon the railway trains, in the railway stations and the public and private schools of the State.

There is no way through which disease could be more easily transmitted from one person to another than through the use of the common drinking cup, and the position taken by the Kansas State Board of Health on this question is to be commended, and the adoption and enforcement of such a regulation in our other States would be of great benefit to the public health.

It would be better not to limit such a regulation, but rather to let it apply to any place of public or private congregation. The use of such drinking cups in hospitals or dispensaries, for instance, where persons suffering from various diseases gather for advice and treatment is most reprehensible, while the use of the common communion cup in churches is a filthy custom, and one which offers unrivalled facilities for the transmission of disease.

SMALLPOX QUARANTINE REMOVED. Montana follows the lead of Minnesota and there will be no quarantine for smallpox in that State after January 1st, 1910. The State Board of Health Bulletin for Aug. '09, says:

"Get vaccinated and protect yourself. The State should not be expected to protect citizens who can protect themselves at a minimum cost, and by the exercise of common intelligence. Smallpox is a disgrace, a dangerous disease, and a reflection upon any person of intelligence."

It remains a fact, however, that in many cases the health authorities have to use their superior knowledge and protect the public against the inclinations of many people.

There are, and always will be, in every community, a small number of people who crave notoriety, and are willing to obtain it by opposing any scientific truth.

These people talk so loudly in their attempts to convince themselves that they win many followers among those who are willing to let others do their thinking.

That a people left to have their own way in the matter of vaccination will not take proper precautions is well shown in Utah, where smallpox is said to be endemic and on the increase.

There is no better way of handling smallpox than by compulsory vaccination, and States following this method have so few cases of the disease that the question of quarantine is but a minor one.

THE BOSTON BOARD OF HEALTH has recently issued a regulation forbidding the exposure of meats, cut fruits, candy, etc., to dust and flies; another regulation forbids the sale of dirty or polluted ice; and a third provides that milk in stores shall not be kept in bulk or sold from open receptacles, as has been the custom, but shall be sold only in the original unopened bottles or cans. These regulations are all conducive to more cleanly and healthful conditions, and the one relating to milk is especially commendable. It is universally accepted that many of the summer diseases of children are caused by impure milk, and no milk is more impure than that sold in the stores of large cities. Any measure which thus prohibits

the promiscuous handling to which such milk is exposed in the ordinary store or bakery, which removes all temptation to mix to-day's supply with what was left from yesterday, and instead offers a comparatively clean bottled product, must be beneficial.

The cost will be slightly higher, but this should be more than compensated for in increased health.

CONNECTICUT TUBERCULOSIS LEGISLATION OF 1909.* The present Legislature has enacted some very important anti-tuberculosis laws. These include an act prohibiting spitting in public places, and while it does not differ greatly from the ordinances now in force in our larger cities, it provides a law applicable to the entire State.

An act concerning the reporting and care of tuberculosis is another measure of great importance. This act declares tuberculosis to be an infectious and communicable disease dangerous to the public health, and requires physicians to report to the local health officer all cases coming under their care, and to give such instructions as will provide for the safety of all persons occupying the same house or apartments. If the physician reporting is not willing to assume the care of the patient, then this duty devolves upon the local health officer. This law takes effect October first, and prior to that date a copy of the act will be sent to all the physicians of the State.

A third act is that appointing a Board of Directors to establish County Homes for the care and treatment of those suffering from tuberculosis. It proposes to establish three of these homes at once and an appropriation of $175,000 is made for this purpose, with $75,000 additional to maintain them for one year. These appropriations, with $50,000 given to aid the Gaylord Farm Sanatorium at Wallingford, Wildwood at Hartford and Undercliff at

*State Board of Health Bulletin, July, 1909.

Meriden, make a total of $300,000 given by the State of Connecticut to aid in carrying on the anti-tuberculosis work during the next two years.

THE FLORIDA STATE BOARD OF HEALTH LABORATORY* has been temporarily closed, pending the engagement of a bacteriologist. Since the State Board of Health established a clinical laboratory five years ago, it has gradually grown in popularity, the number of examinations increasing from year to year. Especial attention has been given to the examination of specimens for the ova of hookworms in the vigorous war now being waged against that disease.

While the majority of the laboratory tests have been made for Jacksonville, where the laboratory is located, the city of Tampa has run a close second, and in response to a petition from the Tampa Board of Trade, the Hillsboro Medical Society and several other organized bodies, together with a great number of physicians, the State Board of Health has decided to establish a branch laboratory in that city.

STATE HYGIENIC LABORATORY IN NEVADA. At the last session of the Nevada legislature a State Hygienic Laboratory was created at the University of Nevada at Reno and the administration placed in the hands of the Board of Regents of the University. Dr. Winfred B. Mack, Professor of Bacteriology in the university there has been appointed Director. Dr. O. P. Johnstone, M. S., M. D., has accepted the position of Pathologist and Bacteriologist.

Dr. Johnstone is a graduate of Rush Medical College. He was formerly Professor of Pathology in the University of Colorado. He left Colorado in the fall of 1907 to become Pathologist at Mercy Hospital, Pittsburg, which position

*Florida Health Notes, Aug., 1909.

he resigned to accept his present one. He is exceptionally well qualified by both temperament and training for this work and the people of Nevada are to be congratulated on securing the services of so competent a man.

TUBERCULIN TEST UPHELD BY COURT.* A decision of great interest to all public health workers and especially to those engaged in working for a pure milk supply was handed down by Joseph G. Donnelly, Referee and Court Commissioner of the Milwaukee circuit court in an action brought against the city of Milwaukee and Health Officer Gerhard A. Bading.

The issue of fact before the referee was that raised in paragraph ten of the complaint which reads as follows: "That the tuberculin test of plaintiff's milch cows required to be made by Section 24 of such ordinance, herein referred to, as plaintiff is informed and believes is wholly unreliable, untrustworthy and entirely worthless so far as being any guide or protection to the public as to whether or not the cows tested by the tuberculin test, as provided by Section 24 are free from the germs of tuberculosis or any other contagious disease."

While certain of counsel contended the only question at tissue was as to the efficiency of the tuberculin test the referee ruled that the allegation as to the worthlessness of the test as a protection of the public widens the field of inquiry and makes relevant testimony offered as to the nature and cause of tuberculosis, the characteristics of the germs producing it in man and cattle, and the transmissibility of the disease from the bovine to the human.

The plaintiff produced a large number of dairymen and farmers who testified both as to the freedom of their families from tuberculosis while drinking freely of milk, much

*It is expected that a more comprehensive report of these proceedings will shortly be published in this journal.

of which was presumably from tuberculous cows, and as to the inefficiency of the tuberculin test as proven by the evident failure to find lesions in condemned cattle from their own farms.

Of the expert witnesses for the plaintiff Dr. Claude D. Morris made the somewhat startling statement that he believed a few bovine tubercle bacilli in milk to be beneficial. Dr. Wilhelm Becker and Dr. Henry L. K. Shaw acknowledged that trustworthy cases of bovine tuberculosis in the human had been demonstrated. Dr. Morris and Dr. Moore, for the plaintiffs, gave testimony confirming the defendant's claim as to the value of the tuberculin test. Among the experts who testified for the defendant were Dr. Park of New York, Drs. Ravenel and Russell of Wisconsin, Dr. Schroeder of Washington, Dr. John R. Mohler, Chief of the Pathological Division of the United States Bureau of Animal Industry, and Dr. Chute and Dr. Clark, respectively former and present State Veterinarian of Wisconsin.

The testimony of these experts, based on years of careful work, was practically unanimous and proved to the satisfaction of the referee that human and bovine tubercle bacilli, while of the same family, have certain distinguishing characteristics, that bovine tubercle bacilli may and do infect the human (Dr. Park concludes that twenty per cent, and Dr. Ravenel that approximately thirty per cent, of tuberculosis and death from tuberculosis in children is due to bovine tubercle bacilli), and that the tuberculin test is an accurate and trustworthy aid for the detection of tuberculosis in cattle.

The referee says: " After careful consideration, I am fully convinced of the value of the tuberculin test. Applied and interpreted by competent men, its efficiency is clearly established. Instead of being unreliable, untrustworthy and worthless it has been proven a marvellously accurate scientific method of ascertaining tuberculosis in cattle." He

reports the following findings of fact upon the testimony taken and other proceedings had:

1. That bovine tuberculosis is transmissible to man.

2. That there is danger of infection to man from bovine bacilli in milk from tuberculous cows.

3. That the tuberculin test, while not infallable, is a reliable, trustworthy and useful diagnostic agent for determining the existence or non-existence of tuberculosis in cattle.

BOOK REVIEWS.

"Tuberculosis," A Preventable and Curable Disease. By S. ADOLPHUS KNOPF, M. D. *Moffett, Yard & Co., New York. With* 115 *illustrations,* 8 *vo.,* $2.00 *net.*

In this volume Dr. Knopf has brought together and elaborated much of the material contained in his many valuable and popular papers upon tuberculosis, with especial reference to the individual in his combat with the disease, and the innumerable social conditions which favor its prevelance and the means of their avoidance.

In the first four chapters the attention is directed particularly to the tuberculous individual, how he should conduct himself to make a successful fight against the disease, and how he should live in order to avoid communicating the disease to others. Much detail is devoted to this part of the subject and the method of the open-aid treatment at home is fully described with numerous illustrations of the many ways, now so fully known, of obtaining open-air conditions, both by day and night. An extended description of the author's window tent is included, together with illustrative reference to various sleeping balconies and shacks. Although so much space is devoted to the care and proper mode of life of the tuberculous sufferer, the book is "not intended to replace the physician," as the author explicity declares at the outset, but to aid both the sufferer and the physician, the supervision and guidance of the latter, as he states, being essential. Unlike some phthisio-therapeutists of the present day, Dr. Knopf still believes that climate has its value in the treatment.

"To deny the beneficial influence of certain climatic regions," he says, "as a valuable adjuvant in the treatment of tuberculosis is as dangerous and unscientific as the belief in the specific curative quality of any particular climate." The weighty responsibility of the physician in taking charge of a case of tuberculosis, both towards his patient as well as towards the consumptive's family, and the community is fully emphasized, as it should be, and one whole chapter is devoted to this most vital subject. By a careful study of this portion of the book, the general practitioner, provided he has made his diagnosis early, will be well prepared to carry out the plan of the open-air treatment, and will appreciate the constant attention to details necessary to obtain success. If any criticism is to be made upon the scheme of treatment it is, in the opinion of the reviewer, in regard to the lack of sufficient reference to the feeding of the patient and to rest and exercise. When and why the patient should rest and when he can take exercise without injury, and how, does not appear to be set forth with sufficient clearness. Neither is the matter of feeding, of such paramount importance, given the attention which it deserves in these days of more exact methods of diet and food values. The careful and exact regulation of the tuberculous patient's diet with reference to his present condition and to the end to be attained deserves as much attention perhaps as the arrangements for his out-door living.

The next seven chapters are devoted to the duties of sanitarians, health authorities, municipalities, states, educators, philanthropists, employers of labor, and all the various official and private instrumentalities in "the combat with tuberculosis" and give the author's well-known views and recommendations as to the duties of these various bodies.

Proper housing is accorded rightfully very considerable attention and plans of modern tenement houses and private

dwellings illustrate the subject. Two very attractive cuts are given of the proposed Shively sanitary tenements, so constructed as to afford a balcony for every apartment. These are soon to be erected in New York City through the philanthropy of Mrs. William K. Vanderbilt, Sr. All the modern means of combatting and treating tuberculosis are described: The Tuberculosis Class, originated by Dr. Pratt of Boston; the Day Camp, first established in the United States by the Boston Association for the Relief and Control of Tuberculosis; the Open-Air School; the Tuberculosis Dispensary; and the Sanatorium. All the State sanatoria now in existence are described and illustrations of some of them are given. A number of pages are devoted to the cleaning of mail-bags; railroad hygiene; breathing exercises for children; the rearing of the child of tuberculous parents; the prevention of smoke and dust, and church hygiene. The educational propoganda by means of the travelling exhibit; lectures with lantern slide illustrations; press notices; popular circulars; tuberculosis Associations, etc., is described. A plea is made for cremation as a preventive measure, both on account of the possibilities of infection through the earth worm, and also on account of its economic advantages.

The recent successful Christmas sale of Red Cross stamps is referred to, and the interesting fact noted that over $100,000 was obtained in this way for anti-tuberculosis work.

Hardly any of the means for the amelioration of the health and living conditions of the masses as indirect means of preventing tuberculosis fail of mention. Playgrounds, swimming tanks and gymnasiums in schools, ventilation of churches, workshops, offices, etc., restriction of child and women labor, the avoidance of the use of alcohol, the care of mothers before and after birth of their children, etc.

In conclusion Dr. Knopf quotes two phrases from Pas-

teur upon which he hopefully moralizes upon the future outlook regarding the ultimate eradication of tuberculosis. The first is the well-known saying: "It is in the power of man to cause all parasitic diseases to disappear from the world," and the other, "Our duty to do good only ends where our power to do good fails."

Among all the other good illustrations there are two excellent full-page ones of Prof. Koch and Pasteur. One cannot help regretting that so excellent a book designed for the general public should not have been published at a price which would bring it within the means of the great mass of people. Many would purchase a dollar book who would wistfully turn away from a two-dollar one, the price of this one. Why, a book the size of this, an octavo of three hundred odd pages, should weigh two pounds, and in consequence seem about as heavy as lead when one holds it in the hands any length of time is a mystery to one uninitiated in the art of book-making. That so much popular literature upon tuberculosis is now demanded by the people is a very hopeful indication of the general interest manifested in the subject. A few years ago hardly any publisher would have considered the publication a popular book upon this subject a profitable venture.

EDWARD O. OTIS.

The Human Body and Health. (*Intermediate.*) By ALVIN DAVISON. *American Book Company: New York, 1909.*

This school hygiene is in some respects in advance of its numerous competitors. Its treatment of infectious diseases and safeguards against them is unusually clear and sensible. The advice given in regard to diet is in the main well considered. But the trail of the W. C. T. U. is over the book. In season and out of season it dwells upon the ruinous effects of alcohol. The beer-drinker's heart

is pictured, a grewsome object. Alexis St. Martin, the favorite hero of text-book writers, is cited to prove that alcohol acts destructively upon the stomach. In view of the fact that the wiry Canadian lived to a great age and was a notorious toper the selection seems unfortunate. Three plates, in widely separated places, show how death overtook the fish in aquaria when extracts of tobacco were added to the water. The book is marred by a few glaring errors, such as the statement that chloroform was introduced as an anaesthetic by W. T. G. Morton.

It is much easier to criticize than to write a manual of hygiene for grammar schools. The laws of most States almost force the author to exaggeration in his temperance teaching. The intrinsic difficulties of the subject are great. Much will always depend on the teacher's discretion in interpreting any text-book and the present one will be useful in capable hands.

P. G. STILES.

CONTENTS